PREVENTION OF OBESITY: EXPLORATION OF LIFESTYLE IN 18 – 25 YEAR OLDS

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Declaration

I declare that this thesis has been composed by me. The thesis, or any work within it, has not been submitted for any other degree apart from abstract submissions for conferences and peer reviewed journal publications. The research it describes has been done by me, except where acknowledged. Dr Lorna Aucott, a medical statistician and one of my supervisors, ran the statistical model. Mrs Stella McHardy provided assistance in conducting the questionnaire survey and Dr Catriona Hughes assisted in conducting the focus groups. All quotations are distinguished by quotation marks and external sources of information acknowledged.

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Acknowledgements and dedication

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I dedicate this work to my lovely family (Elizabeth, Michael and Isaac) and my dear friends. I would never have reached this point without your sustained support; thank you with all my heart.

Abstract

Background: Obesity is a global public health problem with major implications for health and the economy. It is a priority in many countries requiring immediate action for prevention and management of obesity. There are a number of trigger points in the life course where individuals gain weight, including the transition from adolescence to adulthood. This thesis investigates lifestyles associated with obesity among 18 -25 year olds, an age group that is vulnerable to weight gain and obesity, but under-researched.

Aims and objectives: The aim of this thesis was to identify elements or components that are crucial for this vulnerable age group in order to develop a lifestyle intervention for prevention of obesity. The objectives were to identify existing effective interventions in this age group and to explore their lifestyle related to obesity.

Methodology: A systematic review of the literature was initially conducted to identify and critically appraise the evidence on effective interventions in this age group. Then, an explanatory mixed method approach was used to explore the lifestyle of 18-25 year olds in the Grampian region using a questionnaire survey (quantitative study) followed by focus group discussions (qualitative study). The Theory of Planned Behaviour and Social Cognitive Theory were used to underpin the questionnaire and both electronic and hard copies were used to maximise response. In the qualitative phase, seven focus groups were conducted among young people varying in age, education level and socioeconomic status and analysed using Framework Analysis.

Results: The systematic review identified possible effective interventions, but these were short-term and conducted in specific groups of people in controlled environments. A total of 1313 participants completed the survey questionnaires. The self-reported prevalence of overweight or obesity among 18-25 year olds in Grampian was 22% and increased with age. Irregular meal eating patterns, decreasing physical activity levels with age, combined with high levels of snacking when younger (18-19 year olds) were associated with higher BMI. Positive attitudes, gender and employment status explained around 55% of the variation around the intention to eat healthily and adequately exercise. However, the translation of this

intention to actual behaviour was poor for both the behaviours. Barriers preventing healthy lifestyle were mainly lack of time, organising skills during stressful periods and cost. Future health was not a major concern, and neither winning nor impressing others was a motivator. However, ‘appearance’, ‘feel good factor’, ‘to have fun’ and ‘get a buzz’ were the main motivators for young people to eat healthily and sufficiently exercise. Young people indicated the need for constant change and variety and can succumb to mood and day-to-day pressures. They were open to learning skills and seemed to seek family support to develop healthy lifestyles. Misconceptions about the constituents of healthy diet/exercising and the lack of organisation prevented them from sustaining healthy lifestyle behaviours. In addition to individual barriers, lack of facilities and lack of activities tailored to young people of this age group were seen as societal irresponsibility. In spite of identifying some of the crucial elements important in this age group, recruitment and determining the ideal time to intervene will be the challenges still to be addressed.

Conclusion: Small behavioural changes homing in on the immediate benefits along with sustained support are more likely to produce changes in young people’s lifestyle which in turn, might lead to prevention of obesity in the long-term.

CONTENTS

LIST OF ABBREVIATIONS

AEC	Dr Amanda E Clarke
BMI	Body Mass Index
CHI	Community Health Index
CI	Confidence Interval
CHP	Community Health Partnerships
CVD	Cardio vascular disease
DEXA	Dual-energy x-ray absorptiometry
DoH	Department of Health
EFT	Employed full time
EPT	Employed part-time
FPG	Fasting plasma glucose
HBM	Health Belief Model
HDL	High Density Lipoprotein
LSA	Dr Lorna S Aucott
IOTF	International Obesity Task Force
MRC	Medical Research Council
NAO	National Audits Office
NEET	Not in Education, Employment or Training
NHS	National Health Service
NICE	National Institute of Clinical Excellence
OW	Overweight
PA	Physical activity
PE	Physical education
PBC	Perceived behavioural control
SIGN	Scottish Intercollegiate Guidelines Network
SCT	Social Cognitive Theory
SOS	Swedish Obesity Study
SN	Subjective norm
TRA	Theory of Reasoned Action
TPB	Theory of Planned Behaviour
UW	Underweight
WHO	World Health Organisation

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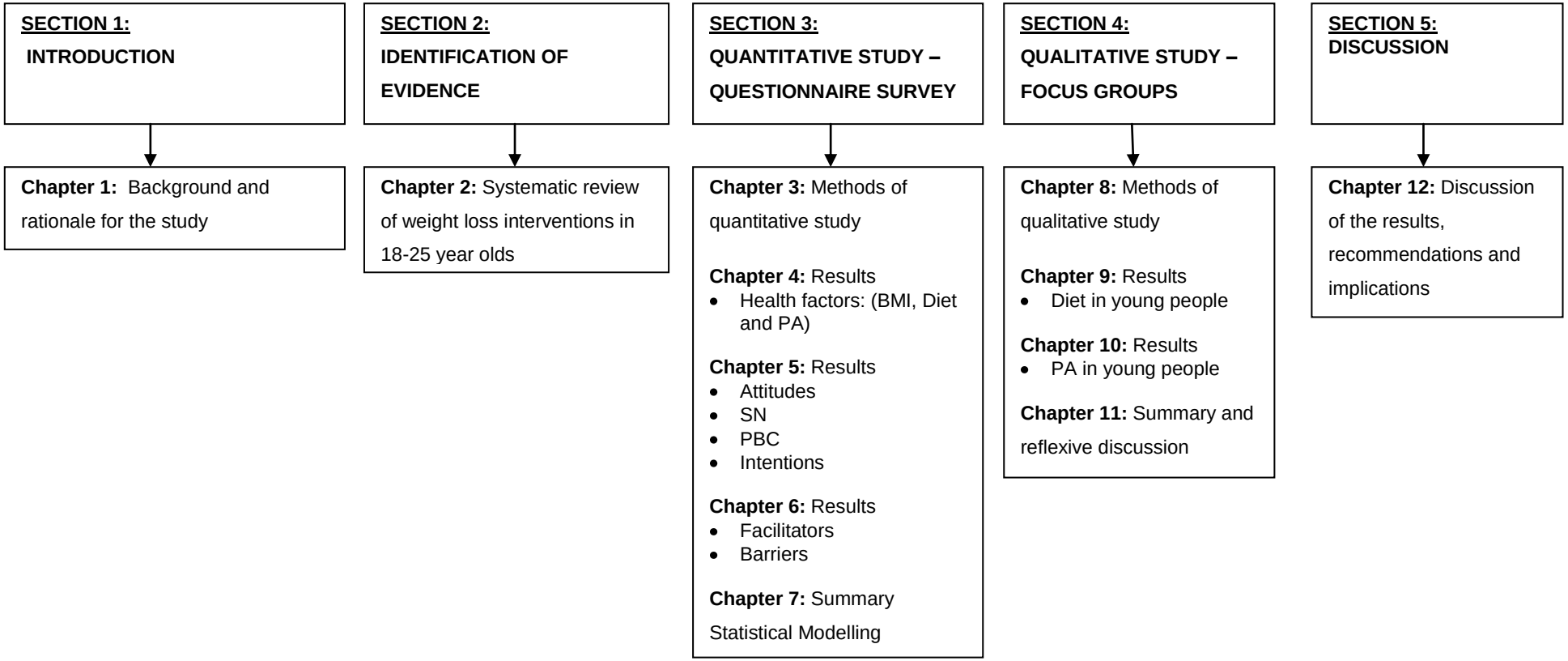
Figure 1.1 FLOWCHART OF THE STRUCTURE OF THE THESIS
PREVENTION OF OBESITY IN YOUNG PEOPLE



SECTION -1

INTRODUCTION

Chapter 1: Background and rationale for the study

1.1 Background

1.1.1 Definition, classification and measurement of overweight and obesity

Overweight and obesity are defined as a process characterised by excessive accumulation of body fat with multiple organ specific consequences that could impair health (SIGN 2010;WHO 2011a). The most common method of assessing the degree of overweight/obesity in adults is Body Mass Index (BMI). This is a simple index of weight-for-height that is calculated by dividing the weight of a person in kilograms by the square of their height in metres (kg/m^2). The international classification of overweight/obesity according to BMI is presented below in Table 1.1 (WHO 2011b).

Table 1.1 International classification of BMI according to WHO (WHO 2011b)

Classification	BMI kg/m^2
Underweight	<18.50
Normal range	18.50 – 24.99
Overweight	≥ 25.00
Obese	≥30.00
Mild/Class I	30 – 34.99
Moderate/Class II	35 – 39.99
Extreme/Class III	≥40.00

Other methods used to measure adiposity are skin fold thickness, waist circumference, hip circumference, waist hip ratio, underwater weighing, bioelectric impedance and more recently dual-energy x-ray absorptiometry (DEXA). BMI is the most frequently used measure of overweight and obesity and it is used in both sexes and in all age groups. However BMI is criticised for its lack of ability to differentiate between fat and muscle mass and also failure to assess the distribution of fat. It might not reflect the levels of fat in different populations (athletes, elderly) due to differences in body proportions (WHO 2011b). Waist circumference is considered the best anthropometric measure of abdominal fat and can indicate the total body fat. Waist circumference of >94cms in men and >80cms in women increases the risk of

obesity related health problems (SIGN 2010). Although measures like DEXA are more precise measures of total adiposity, it is more difficult and expensive, and does not necessarily add more information than that provided by BMI or waist circumference, which are simple and relatively easy to measure (Sierra-Johnson et al. 2004). Correlations among the measures of adiposity found that BMI is highly correlated with fat mass and waist circumference and probably the most useful population level measure (Stevens, McClain, & Truesdale 2008). A recent study that analysed the predictive ability of BMI, waist circumference and waist hip ratio for cardiovascular disease showed that each have a similar strength of association with CVD risk but the long term reproducibility of BMI is superior to that of waist hip ratio or waist circumference (The Emerging Risk Factors Collaboration 2011).

1.1.2 Aetiology of obesity

There is a general agreement that genetic susceptibility combined with chronic positive energy balance due to unhealthy lifestyle behaviours is the key feature in the development of obesity (Hill & Melanson 1999;Nielsen et al. 2006). Studies on genetics of obesity have shown that inter-individual differences in susceptibility to obesity have strong genetic determinants (O'Rahilly S & Farooqi S 2006). Heritability for BMI, defined as % of inter-individual variation in a trait that can be explained by inherited factors, ranged from 30-50% in primary family studies and 50-70% in twin studies (Allison DB & Faith MS 2000) (Maes HM, Neale MC, & Eaves LJ 1997;Schousboe et al. 2003). A paper in 2006 (O'Rahilly S & Farooqi S 2006) reported that hereditary factors influence obesity not only by affecting the metabolic rate and selective partitioning of excess calories into fat, but also by having a likely impact on hunger, satiety of food intake. Studies also argue that obesity rates have risen worldwide in spite of no change in the gene pool in recent decades (Allison DB & Faith MS 2000) possibly due to changes in environmental and/or lifestyle factors. The dramatic increase of obesity levels in recently urbanised populations like Fiji (Ulijaszek 2005) and higher levels of obesity in migrant populations, who have the same genetic composition but

moved to a different obesogenic environment (Dhawan et al. 1994;Patel et al. 2006) is further evidence for the role of environmental and life style factors in causing obesity.

Poor dietary behaviours (Niemeier et al. 2006) compounded by decreased levels of physical activity (Fotheringham, Wonnacott, & Owen 2000) have created an obesogenic environment leading to increase in obesity. Prepackaged , readymade convenience meals are often eaten in front of television, video or computer (Davey 2003). Occupation related physical activity (PA) has decreased over the years as many manual tasks are replaced by automated machines and labour saving devices, leading to more sedentary jobs (Charlton J & Murphy M 1997;Davey 2003). Domestic activity has also decreased in the past few years with labour saving devices at home. Consumer driven attitudes such as owning a car as a status symbol have made an impact on the decreased levels of physical activity in developing countries (Simkhada P et al. 2009). In England, between 1975 and 2003, distances walked or cycled for transport reasons decreased while usage of the car increased by over 10% where 1/5th of all journeys by car were less than a mile (Butland B et al. 2007;Fox KR & Hillsdon M 2007). People walked 63 miles/person/year less in 2003 compared with 1975 according to a 2004 National Travel Survey (Department of Transport 2005). A recent update of this has shown that in 2009, 63% of all trips were made by car compared to 25% by walking or cycling (Department for Transport 2010). Policies on food production, advertising, promotion and easy availability of energy dense food have also contributed to the increase (Davey 2003).

1.1.3 Global obesity epidemic

Obesity was recognised as a disease (category 287) by the World Health Organisation (WHO) when it was established in 1948 (WHO 1948) and this status has been retained (category 278, in 1975 update) to date (WHO 1975). However, obesity as a potential public health problem over the past three decades in the developed world, was considered irrelevant elsewhere until the mid 90s. By 1995 WHO realised that obesity was a problem not only in developed countries but more of a problem than underweight in many developing countries (James 2008). The International Obesity Task Force (IOTF) was specifically set up

in 1997 to collate evidence on obesity globally and the expert technical Consultation that followed highlighted the escalating global epidemic of obesity (James 2008;WHO Consultation 2000).

A fact sheet by the WHO (WHO 2011a) indicated that in 2008, there were globally 1.5 billion adults (age 20+) overweight and of these, more than 200 million men and nearly 300 million women were obese. As cited in Bogers (Bogers et al. 2010), almost two-thirds of American adults, 60% of the English people above 16 years and 60% of Australians above 25 years are either overweight or obese. The WHO has estimated that by 2015, approximately 2.3 billion adults will be overweight and 700 million will be obese. Further projections to 2030, has suggested that about 58% of the world's population (3.3 billion) could become either overweight or obese (Kelly et al. 2008).

Current obesity levels range from 5% in China, Japan and in some African countries to over 75% in urban Samoa (Kumanyika et al. 2002). Countries that are undergoing economic transition are facing a "double burden" of disease (WHO 2011a) where under-nutrition and obesity are existing side-by-side within the same country. Even in a low prevalence country like China, the obesity rate is as high as 20% in some cities (Puska P, Nishida C, & Porter D 2003). Consequently, obesity has become one of the major public health concerns globally since the mid 90s, in par with more traditional public health issues such as the under-nutrition and infectious diseases.

1.1.4 Prevalence of obesity in the United Kingdom

Prevalence of obesity in the United Kingdom has been gradually increasing over the past two to three decades from 6-8% in the 1980s to 23% in 2001. In spite of targets set by the government over the years (e.g. Health of Nation 1992) to reduce levels of obesity in adults and children, reviews conducted by National Audit Office (NAO) in 1996 (NAO 1996) showed no evidence that these policies have changed the growth of obesity; in fact, it has continued to rise. The 2005 Health Survey for England report (Jotangia D et al. 2006) showed two

thirds of adults and one third of the children as overweight or obese in England. If the upward trend remained unchanged, recent reports by Department of Health (Butland B et al. 2007;Zaninotto P et al. 2006) have predicted significant increase in the prevalence of obesity. The recent 'Foresight document' predicted that on the current trends, by 2015 36% of males and 28% of females in the UK will be obese and this will further increase to 60% of obese males and 50% of obese females by 2050 if no action is taken (Butland B et al. 2007).

In Scotland, based on the Scottish Health Surveys in 16-64 year olds, the prevalence of obesity (BMI) has risen from 16% to 25% among men and 17% to 27% among women between 1995 and 2008 (Corbett J et al. 2009). The proportion of people with central obesity has also increased, especially in women over these years (14%-25% in men and 19% to 34% in women).

1.1.5 Consequences of obesity

Obesity has become one of the major contributors to the global burden of disease and disability. It is one of the main risk factors for a number of life threatening non-communicable disease such as heart disease, type 2 diabetes, hypertension, stroke and certain types of cancers (endometrial, breast and colon) (Kumanyika et al. 2002). Cardiovascular diseases (heart disease and stroke) kill 17 million people globally each year and deaths due to diabetes is predicted to increase by more than 50% worldwide in the next ten years (WHO 2011a). Obesity also contributes to debilitating conditions such as osteoarthritis, gall bladder disease and respiratory problems often reducing quality of life (Amador et al. 2008;Kumanyika et al. 2002).

A recent review in 2009 on the stigma of obesity reported that obese people face discrimination in employment settings, health care facilities and educational institutions (Puhl & Heuer 2009). Discrimination against obese people among Americans rose by 66% between 1995 and 2004 (Andreyeva, Puhl, & Brownell 2008) on a par with racial discrimination (Puhl, Andreyeva, & Brownell 2008). This discrimination has psychological

consequences leading to depression, body dissatisfaction and low self-esteem among obese people (Puhl & Heuer 2009).

Increase in obesity levels not only has grave consequences for individuals with increased risk of many co-morbidities but also has cost implications. The economic costs of obesity estimated by IOTF as cited in the paper by Kumanyika (Kumanyika et al. 2002) highlights that obesity accounts for 2-6% of total health care costs in many developed countries. In the UK, costs to the NHS and to society as a whole, is estimated to be £7 billion and forecast to reach £50 billion per year by 2050 (Butland B et al. 2007). In Scotland the cost of treating obesity and obesity related illness in 2001 was £171 million (Walker A 2003). The total cost to Scottish society of obesity in 2007/08 was estimated to be in excess of £457 million (The Scottish Government 2010a).

1.1.6 Response to obesity epidemic in the United Kingdom

In response to obesity emerging as a major public health problem in the mid 90s, action was taken by Department of Health in England and Scottish Intercollegiate Guidelines Network (SIGN) in Scotland by producing guidelines on how to reverse the increasing problem of obesity (Department of Health 1995) along with integrating prevention and weight management (SIGN 1996). Since then, several strategies and guidelines have followed both in England and Scotland to combat increasing levels of obesity (Cross Government Obesity unit 2008;Cross Government Obesity unit 2010;Grant I, Fischbacher C, & Whyte B 2007;NICE 2006;SIGN 2010;The Scottish Government 2008;The Scottish Government 2010a). An update on the English cross government strategy was published in March 2010 reporting some evidence that the rapid increase in childhood obesity may be leveling off but that prevalence remained high. However, prevalence rates in teenagers remained high and increased in boys and prevalence in adults had slightly increased from 24 to 24.5%. The new SIGN guidelines recommend that all weight management programmes should incorporate dietary, physical activity and behavioural components (SIGN 2010). In response to the number of guidelines and recommendations published over the years, a framework was

developed and proposed to address issues including targeting, ownership, monitoring and evaluation, time frame and resource implications within policies/recommendations, for successful implementation of these guidelines (Poobalan et al. 2010a), Appendix 8.1.

1.1.7 Past research on obesity

Since the mid 90s, various diet, exercise, behavioural and drugs interventions have been developed and trialled for the treatment of obesity. In early 2000, these interventions were systematically reviewed to identify effective interventions for treatment of obesity. These reviews showed some short-term beneficial effects on many health outcomes but the evidence for long-term sustainability of these benefits was limited (Anderson et al. 2001;Aucott et al. 2004;Aucott et al. 2005;Avenell et al. 2004;Poobalan et al. 2004). Consequently, studies began to suggest that the focus should be on prevention of weight gain to combat the consequences of obesity (Davey 2003;The National Task Force on Prevention and Treatment of Obesity 1994). Identifying transition points in the life course and time periods where individuals are at high risk of gaining weight was one of the approaches suggested to help change behaviour in an attempt to prevent obesity(King AC et al. 1998;Leermakers EA, Anglin K, & Wing RR 1998;NICE 2007).

1.1.8 Triggers for weight gain

Research has identified various key trigger points in an individual's life course, where significant life style changes make them vulnerable to weight gain. These critical time periods for weight gain were early on in the course of cohabitation, newly married (Burke et al. 2002;Kahn & Williamson 1990), leaving home to go to University/College (Butler et al. 2004;Graham & Jones 2002;Hodge CN, Jackson LA, & Sullivan LA 1993;Hovell et al. 1985), pregnancy (Linne et al. 2003;Rooney & Schauberger 2002), puberty and child rearing years (Burke et al. 2004;Williamson 1993) and retirement (Chung, Domino, & Stearns 2009;Forman-Hoffman et al. 2008).

1.1.9 18 – 25 year olds as high risk group for weight gain

Young people between 18-25 years are in transition from adolescence to adulthood. Positive and negative health behaviours established during this transition to adulthood persist later in life (Parcel G, Muraskin L, & Endert C 1988) and hence it is a critical stage in a person's life course (Howarth C & Street C 2000). Young adults between the ages of 18 and 25 are likely to experience at least one of the triggers mentioned above, except retirement. In addition, being overweight at the age of 25, is associated with early retirement (before 65 years) due to health reasons (Houston, Cai, & Stevens 2009). Consequently 18-25 year olds are a high risk age group for weight gain.

1.2 Obesity in young adults

1.2.1 Triggers for weight gain in 18 -25 year olds

Between 18-25 years of age, young people experience one or several of the life changing experiences identified in the literature that makes them vulnerable to weight gain. These triggers are described below:

1.2.1a Leaving home/independent living: Leaving home to start higher education or employment is one of the critical times for possible weight gain. While around 90% of 18

year olds still live with their parents, by the age of 25 only a quarter of them do (Howarth C & Street C 2000). Transition to university is seen as a time of displacement, when young people feel a sense of *'loss'* and *'discontinuity of their identity'* as they leave behind a familiar context (Scanlon L, Rowling L, & Weber Z 2007). The average weight gain among students who leave home to go to university ranges from four (Graham & Jones 2002) to eight pounds (Hovell et al. 1985) in their first year of University. The study by Howell (Hovell et al. 1985) also reported that young women at university gain more weight than those in the community. A study in 2003 reported that 74% of students gained weight during their first semester of college (Anderson DA, Shapiro JR, & Lundgren JD 2003).

Studies have speculated that this weight gain is probably due to changes in dietary pattern (Hovell et al. 1985) and decreased physical activity (Fotheringham, Wonnacott, & Owen 2000;Raymore LA, Barber BL, & Eccles JS 2001) associated with independent living. There is evidence that levels of physical activity decrease in young people as they moved from adolescence into a more adult life style pattern. A study among Australian college students, (median age of 20 years) reported that 47% of women and 32% of men did not do adequate amounts of exercise (Leslie et al. 1999). A more recent study from Ireland (Mullaney MI, Corish CA, & Loxley A 2008) reported that in the first year at university 35% were inactive and only 56% were moderately active. Between the ages of 18 and 25 years, sedentary behaviour seem to increase by 20% in men although no changes were observed among women (Burke et al. 2004).

1.2.1b Marriage and cohabitation: A longitudinal study of young adults looking at the changes in health related behaviour and social circumstances, showed that co-habitation (living with a partner) was significantly associated with increase in BMI and weight in both men and women, that there was an increased energy intake among women and a fall in energy intake among men but a decrease in physical activity in men (Burke et al. 2004). Studies that have assessed food habits of newly married couples showed that wives took responsibility and made decision about food purchasing with husbands likely to make

convergent changes in eating habits (Craig & Truswell 1988;Craig & Truswell 1994). The odds of experiencing weight gain were independently associated with becoming married in a study by Kahn albeit in 25 to 44 year old males (Kahn & Williamson 1990).

1.2.1c Pregnancy and child rearing: The study by Burke (Burke et al. 2004) showed that the women with children gained an average of 8.7kgs between the ages of 18-25 compared to 6.6kgs among those who did not have children, although this was not significant. There was a significant increase of waist circumference of 8.0 cm in young women with children compared to those without children (3.5cm). Young women, 18-25 year olds, with children were significantly more sedentary (53%) compared to those without children (38% sedentary). This difference was not significant among men although proportions were similar (53% sedentary with children and 40% without children). Energy intake increased significantly between the ages of 18-25 in women with children but did not differ in men.

1.2.2 Prevalence of obesity among 18-25 year olds

Prevalence of obesity in the 18 - 23 year olds has ranged from 22.9% (Mirmiran, Mirbolooki, & Azizi 2002) to 35% (Lowry et al. 2000), and more in some ethnic groups (50% overweight or obese in African men) (Gross, Scott-Johnson, & Browne 2005). More recent studies have shown that overall, more than a third of young men (32.2%) and young women (32.8%) aged 16-24 are overweight or obese (Stamatakis E 2005). Between the years 1991 to 2001, the greatest increase in obesity (BMI >30) was found amongst the 18-29 year olds (7.1% to 14%) (Huang et al. 2003;Mokdad et al. 2003). More recent reports (Stamatakis E 2005) confirm this trend among young adults aged 16-25 during the period from 1995 and 2002, where the prevalence of obesity increased by 3.7% in young men and 3.9% in young women.

A cohort study with young women between 18-23 years at baseline, followed them up for 4 years and showed that during this time 41% of women gained weight with only 15% losing weight (Ball, Brown, & Crawford 2002). A similar longitudinal study of young adults measured

young people both at 18 and then at 25 years old (Burke et al. 2004) showing a weight increase of 12% in men and 8% in women with similar increases in waist circumference (10% in men and 6% in women). In this study, overall increase in overweight/obesity was 26% in men and 18% among women between ages of 18-25.

1.2.3 Attitudes of young people on obesity

There is limited literature (Lake et al. 2009;Mullaney MI, Corish CA, & Loxley A 2008;Okonkwo O & While A 2010) on the perceptions and attitudes of young people towards obesity and weight management. These are three studies all of which are quantitative questionnaire surveys, although one study (Mullaney MI, Corish CA, & Loxley A 2008) used few student quotes in their discussion and had no description of the qualitative methods used in the methodology section. All three studies reported positive attitudes among young people towards diet, physical activity and environment. The first year results of a four year longitudinal study (Mullaney MI, Corish CA, & Loxley A 2008) set up among 18-22 year olds studying to become home economics teachers in Ireland, reported that in spite of choosing to follow a career to teach healthy behaviours, detailed knowledge about obesity and nutrition was in fact low in this group. The general positive attitudes towards the dietary advice (62%) and physical activity (67%) were not reflected in their behaviour (20% for diet; 2.1% for physical activity). These students did not perceive themselves to be at greater risk of becoming obese but did think that they were at greater risk of becoming overweight. In the study by Okonkwo (Okonkwo O & While A 2010) students studying health related subjects in London thought that obesity was an important public health issue and supported schemes such as a ban on advertising aimed at children, compared to those studying non-health related courses. This study also identified personal motivation (89%) and busy lifestyles (76%) as barriers to weight management although 97% held individuals most responsible for tackling obesity.

1.2.4 The neglected age group

The WHO technical report in 2000 (WHO Consultation 2000) identified, early adulthood as one of the 'high risk population' to gain weight, due to changes in their social and environmental circumstances. The major changes in lifestyle with independent living, is often associated with an increased social life and a decrease in physical activity all of which make them vulnerable to weight gain (Clement et al. 1971;Gordon-Larsen et al. 2004;Huffman & West 2007;Pierce et al. 1992;Sheehan et al. 2003). In spite of the recognition of this vulnerable age group whose prevalence of obesity is increasing, it is a neglected age group compared to children or middle aged adults (Gary et al. 2006;Howarth C & Street C 2000). The report by New Policy Institute in 2000 highlighted the importance to focus on the "*older end of the age spectrum of young people"* as they are usually sidelined and lose out relative to other age groups (Howarth C & Street C 2000). A recent report in 2004 emphasised this group to be the 'hard to reach' age group in terms of many social issues such as unemployment, crime rates and homelessness (The Prince's Trust 2004).

1.3 Rationale, Aims and Methodology

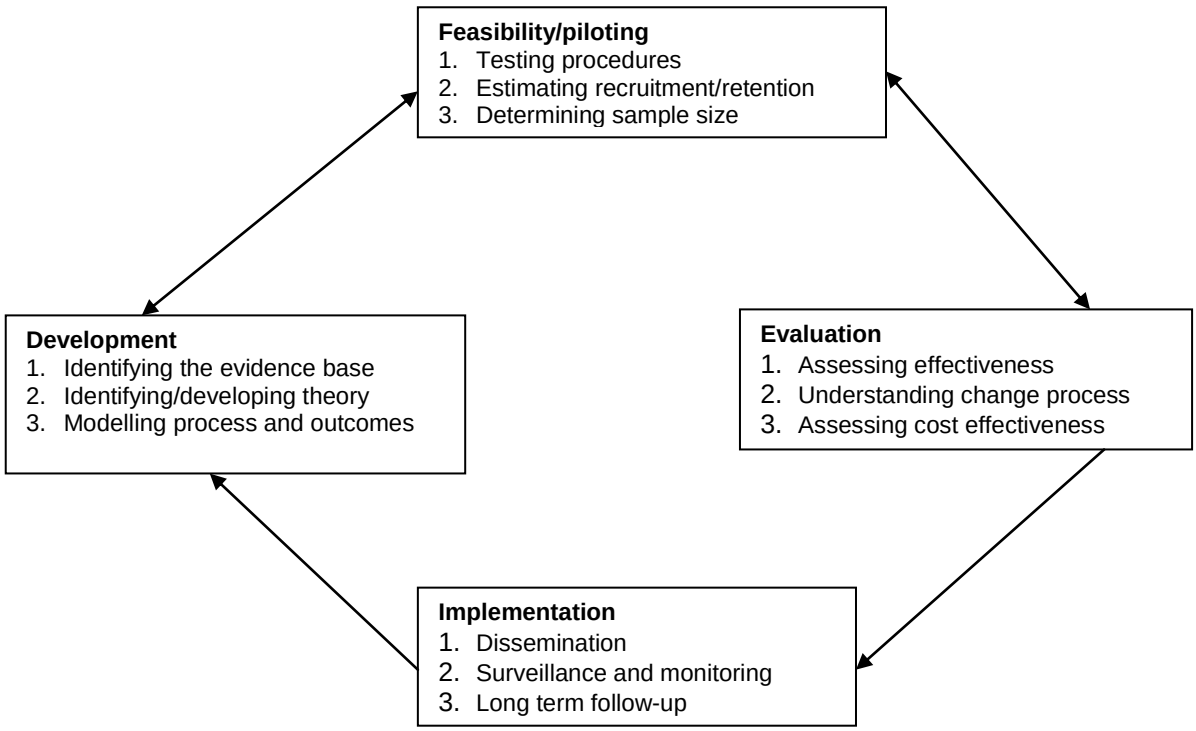
1.3.1 Rationale for research among 18-25 year olds

The previous sub sections highlighted the growing problem of obesity and the severe physical and psychological consequences. Given the limited evidence for successful interventions to treat obesity, the ideal way forward is to encourage and improve a healthy lifestyle, to prevent obesity. The NICE guideline on behavioural change (NICE 2007) highlights that it is important to identify the target population, contextual (barriers/ opportunities for change) and social factors that might affect behaviours when planning for any health improvement interventions. Young people (18 -25 year olds) go through life changing circumstances, develop and establish lifestyle and behavioural patterns for themselves, and also are likely to become responsible for younger children. Despite being identified as a vulnerable group, 18-25 year olds are neglected and under researched.

Consequently, targeting this crucial but neglected group is important for prevention of obesity.

As there are many lifestyle factors related to obesity (e.g. diet, physical activity), any intervention to prevent obesity in this age group is likely to require 'complex intervention' with various interacting components. The dimension of complexity includes interaction between intervention components with various behaviours needing to be addressed. The 2006 MRC guidance on developing and evaluating complex interventions (Craig P et al. 2006) which followed on from the initial framework published in 2000 to improve health (MRC 2000) identifies four key stages of this process and the main functions and activities at each stage (Figure 1.2).

Figure 1.2 Key Elements of the development and evaluation process (Craig P et al. 2006)



'Development' has been identified as one of the initial key elements of the *development - evaluation - implementation process* before developing and piloting an optimal intervention. The study by Campbell stressed the importance of descriptive studies and qualitative testing to help define relevant intervention components (Campbell et al. 2000). This thesis investigates the specific vulnerable group (18 -25 year olds) using the activities identified in 'Development' stage.

1.3.2 Aims and objectives

Aim:

To identify the elements or components, based on the available literature and the exploration of lifestyle in 18 -25 year old age group, in order to develop lifestyle interventions for prevention of obesity in this vulnerable age group

Objectives:

1. To identify and critically appraise existing evidence of effective interventions for obesity prevention specifically in the 18-25 year old age group
2. To, i) explore the perceptions, knowledge, attitudes and behaviour; and ii) identify motivational factors, barriers and facilitators with respect to lifestyles related to obesity, with this age group

1.3.3 Methodology for research

The literature suggests that different perspectives should be combined and appropriate methods chosen to address a research question to give a balanced approach (Snape D & Spencer L 2005;Watts T et al. 2001). Hence different methods that complement and strengthen each other were chosen to appropriately address the aims of this thesis.

The methodology used is described below:

Objective 1: To identify the existing evidence base, a systematic review of the literature was conducted on various electronic databases to identify and critically appraise studies that have assessed weight loss interventions in the 18-25 year old age group.

Rationale:

The rationale for conducting a systematic review was that it uses explicit systematic methods to collate empirical evidence to answer a specific question (Higgins JPT & Green S 2009). The objectives were clearly stated, eligibility criteria were pre specified and a systematic search of the literature was conducted to identify relevant studies that would meet the eligibility criteria. Another key characteristic of systematic reviews is that the assessment of the validity of the findings from the included studies is such that bias is minimised and reliable findings are provided from which conclusions can be drawn (Oxman AD & Guyatt GH 1993).

Objective 2: An explanatory mixed method approach (quantitative method followed by qualitative method) was used to gather more understanding of the lifestyle of young people.

Rationale:

For the design: A mixed method research design combines qualitative and quantitative approaches within a single study or series of studies to understand a research problem (Tashakkori A & Teddlie C 2008). The purpose of this type of research was that both the quantitative and qualitative methods in combination provide a better understanding of a research problem than either method alone (Creswell J W & Plano Clark VL 2007). Traditionally quantitative and qualitative methods were seen as belonging to different paradigms or world views often irreconcilable (Foss & Ellefsen 2002). As cited in a recent report (Golafshani N 2003), the quantitative paradigm, measures information in a standardised manner, is quantified mathematically and the results expressed statistically. In contrast, a qualitative paradigm does not quantify but uses a naturalistic interpretative approach to understand and illuminate the phenomenon in the real world setting. Due to this paradigmatic difference, it was considered too complex to combine qualitative and quantitative methods (Guba EG & Lincoln YS 1992). However, more recently, researchers have taken a moderate view on combining qualitative and quantitative methods

(Onwuegbuzie AJ & Johnson RB 2006). The emphasis is now on choosing appropriate methods for addressing the research question, rather than focusing too much on the underlying philosophical debates (Casebeer & Verhoef 1997;Sale JEM, Lohfeld LH, & Brazil K 2008;Snape D & Spencer L 2005). A recent paper (Foss & Ellefsen 2002) looking at the value of combining qualitative and quantitative methods in social research recognized that combining the two approaches provides different, non-competing knowledge. While quantitative study provides an overview (breadth) of a problem, a qualitative approach gives an insight (depth) into a phenomenon, hence each tap into different domains and when combined yield a richer understanding of the problem (Foss & Ellefsen 2002). Consequently, combining quantitative and qualitative methods (mixed method study) for this thesis was seen as a complementary strategy appropriate to address the research question rather than being competing and contradictory(Ritchie J 2005).

Choosing the type of mixed method approach: There are four major types of mixed method designs identified in the literature: the Triangulation design, Embedded design, the Explanatory design and the Exploratory design (Creswell JW & Clark VP 2007).

Triangulation design: This design directly compares and contrasts quantitative statistical results with qualitative findings or validates quantitative results with qualitative data. This is usually a one phase design conducted at the same time.

Embedded design: One dataset provides a supportive, secondary role in a study based mainly on the other data type. This is useful when researchers want to use a smaller qualitative component within a larger quantitative study.

Explanatory design: Here, qualitative data is used to explain or expand on the initial quantitative results. This is a two phased study, which starts with the collection of quantitative data and qualitative data follows from or connects to the results of quantitative data.

Exploratory design: This is also a two phase study design where the initial qualitative results help develop or inform the second quantitative method. This design is based on the premise that an initial exploration is needed where measures/ instruments are not available and there is no guiding framework or theory.

The selection of which type of mixed method approach to use, depends on the research problem to be addressed. The ultimate aim of this thesis was to develop an intervention to change the lifestyle behaviour of young people eventually to prevent obesity. The 'development stage' of the MRC framework suggests identification of an appropriate theory to develop such an intervention. There are already several psychological behavioural theories highlighted in the literature (Noar SM & Zimmerman RS 2005;Walker AE et al. 2003) attempting to understand and explain human behaviour, in terms of the factors that can be changed such as beliefs and attitudes. While some of these theories have been used to develop interventions in a few conditions such as cervical cancer screening (Bish A, Sutton S, & Golombok S 2000) and bicycle helmet use (Garcia K & Mann T 2003), the knowledge about the usefulness of these theories in prevention of weight gain in specific age and/or ethnic groups is limited (Baranowski et al. 2003).

For this thesis, in line with the development stage of the MRC framework, it was decided that 1) an appropriate theoretical basis should be identified; 2) based on this theoretical framework, a questionnaire survey would be conducted to gain an overview of the lifestyle of young people and; 3) a qualitative study would follow for a deeper understanding of their lifestyle. This approach lends itself to the **'Explanatory mixed methods study'.**

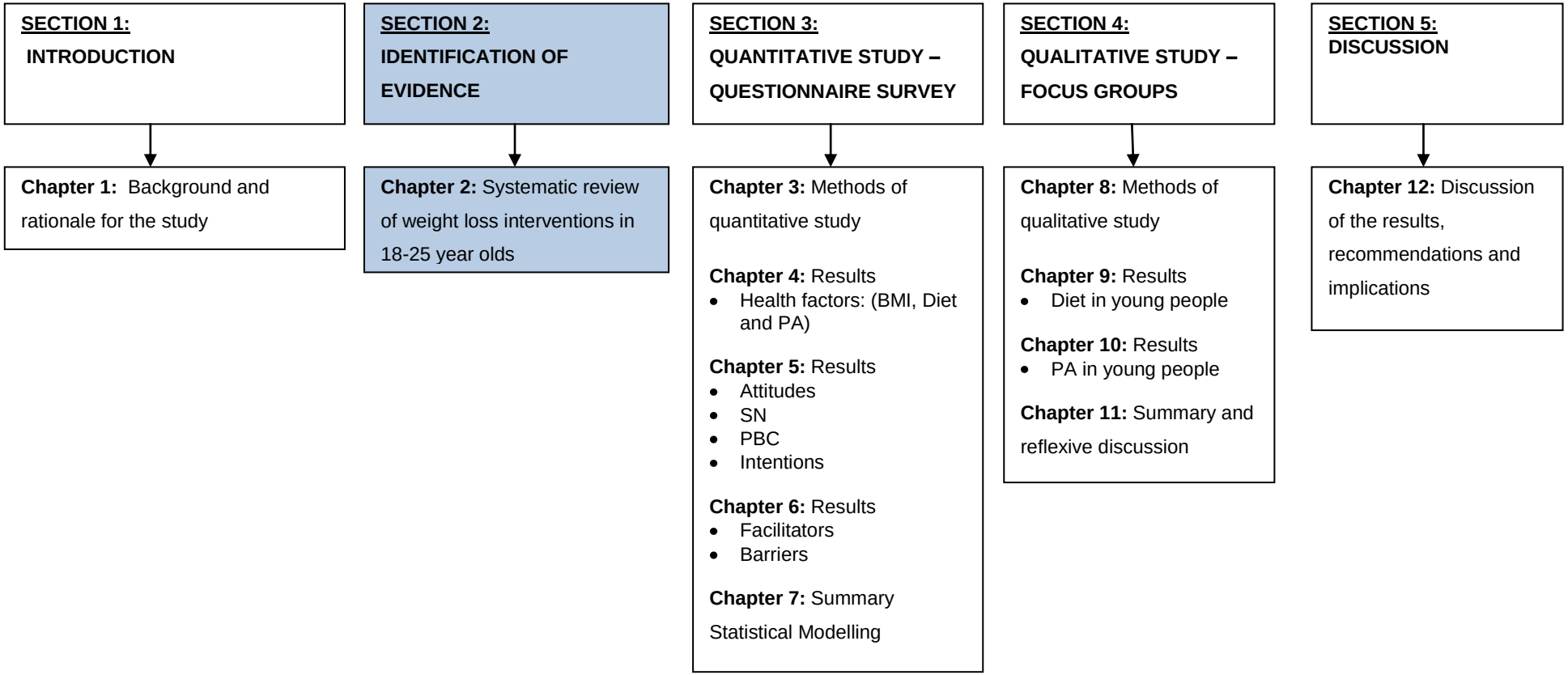
Consequently, a questionnaire survey was initially conducted among 18-25 year olds assessing the lifestyle characteristics for general health and also those specific to obesity including barriers and facilitators. This was followed by a qualitative study using focus groups to explore further the lifestyle (behaviour) of young people by identifying their attitudes; forces and influences that drive their behaviour; barriers and facilitators for leading a healthy lifestyle and prevention of obesity.

The theoretical basis, process of data collection and the framework for data analysis for each of these methods are discussed in respective sections 2, 3 and 4.

SECTION – 2

IDENTIFICATION OF EVIDENCE

Figure 1.1 FLOWCHART OF THE STRUCTURE OF THE THESIS
PREVENTION OF OBESITY IN YOUNG PEOPLE



Chapter 2: Systematic review of weight loss interventions in 18-25 year olds

The main aim of this section is to identify and critically appraise the evidence base of existing effective weight loss interventions in this age group. A systematic review was conducted for relevant interventions conducted with the 18-25 year old age group. In addition, indicators of any barriers and facilitators for implementation reported within the identified studies, was extracted.

2.1 Method of review

The methodology for this review draws from systematic review methods developed by the Cochrane Collaboration as well as the NHS Centre for Reviews and Dissemination (Bruce J & Mollison J 2004;Centre for Reviews and Dissemination 2008;Higgins JPT & Green S 2008).

2.1.1 Inclusion criteria

2.1.1a Type of studies: All trials (Randomised controlled trials, Controlled clinical trials, Non-randomised trials) and cohort studies with control groups of life style interventions undertaken in young adults between the ages of 18-25 years. There was no language or geographical restrictions.

2.1.1b Types of participants: Young people between the ages of 18-25 years.

2.1.1c Types of intervention: Both single and multi-component interventions of diet, physical activity, behavioural modification or any other lifestyle modifications were considered, where the intervention was compared either to standard care or to no intervention.

2.1.1d Outcome measures: The main outcome measures assessed were change in body composition such as body weight, body mass index (BMI), fat mass, percentage body fat, and lean body mass. Secondary health outcome measures considered were total cholesterol, HDL cholesterol, insulin, glucose and maximum oxygen uptake. Psychological measures such as improvements in depression, motivation, self-esteem were also considered, if presented in the papers.

2.1.2 Exclusion criteria

Studies in children and adolescents were excluded. Initially, full texts of abstracts with terms such as 'subjects' and 'participants' 'men and women', 'adults', and those with a wide age range (e.g. 18-65) were retrieved and the age group of the participants assessed. However, it became apparent that these were numerous. A sample of around 100 of these papers were assessed and it became clear that most of these studies covered adult populations with a mean age in the mid-forties and that the results of the age group of interest (18-25) were not presented separately. Consequently, the abstracts with the above terms were excluded on the assumption that studies focusing on young adults would specifically mention them in the key words or abstracts. Abstracts that stated 'young people', 'university students', 'college students' and 'youth' were thereafter selected and checked for the age range and included if they were between 18-25.

Drug and surgical interventions, young people with chronic diseases such as cancer, eating disorders, and various syndromes were excluded since drugs and surgery are in the main used for morbidly obese participants, not the norm for the 18-25 age group. In addition, the subjects of studies that used drugs often had other associated complications i.e. chronic conditions, diabetes mellitus, cancer.

2.1.3 Literature search

A systematic literature search was undertaken on five electronic bibliographic databases *(Medline, Embase, Cinahl, PsychINFO and Cochrane Library).* The review included literature published between 1980 and July 2008 with no language restrictions. A search

strategy was developed using mesh terms and text words for trials including ‘randomised controlled trials’, ‘controlled clinical trials ‘, ‘clinical trials’, ‘interventions trials’ were combined appropriately with terms for ‘obesity’, ‘overweight’, ‘weight loss’ and terms for ‘lifestyle’, ‘diet’, ‘exercise’, ‘behaviour’ to identify all relevant studies. The Medline search strategy was adapted for the other databases searched. Full details of the search is described in Appendix 1.1, pg 261.

2.1.4 Data collection

2.1.4a Selection of studies: All identified citations were transferred to a bibliographic database (Reference Manager 11). To identify relevant studies, abstracts were divided up and read by two independent reviewers (myself and supervisor). Full articles of the studies meeting the selection criteria were obtained for critical appraisal. Reference lists of all studies and review articles included were also checked to identify other relevant studies. Only two foreign language papers (Korean and Japanese) were identified to be relevant and were professionally translated into English.

2.1.4b Data extraction and management: A data extraction form was designed, piloted and amended prior to use by two independent reviewers to extract the data from the papers (Appendix 1.2, pg.263). Supervisors were consulted regularly to discuss any inclusion queries as they arose. Data was recorded on: year of publication and authors, study design, method of randomisation and allocation of concealment if appropriate, characteristics of the participants, details of intervention, outcomes, assessment and follow-up.

2.1.5 Methodological quality assessment of the studies

The methodological quality of each included study was assessed using a standard quality assessment form adapted from the Cochrane collaboration and Jadad scale (Jadad et al. 1996) by two reviewers (Appendix 1.2, pg.263). Primary studies were assessed on their quality of random allocation of concealment, comparability of groups at baseline, health care providers blinding, outcome assessors blinding to interventions, follow-up time, % follow-up,

dropout details, use of validated outcome measure, quality of reporting the outcomes and intention to treat analysis. Each of these criteria was graded from 0 to 2 according to the strength of compliance giving a maximum total of 20. Each study was subsequently classified on the basis of the score obtained; total scores of <10 were considered to be weak, scores between 10-15 as moderate and scores >15 were considered to be of good quality.

2.1.6 Statistical analysis

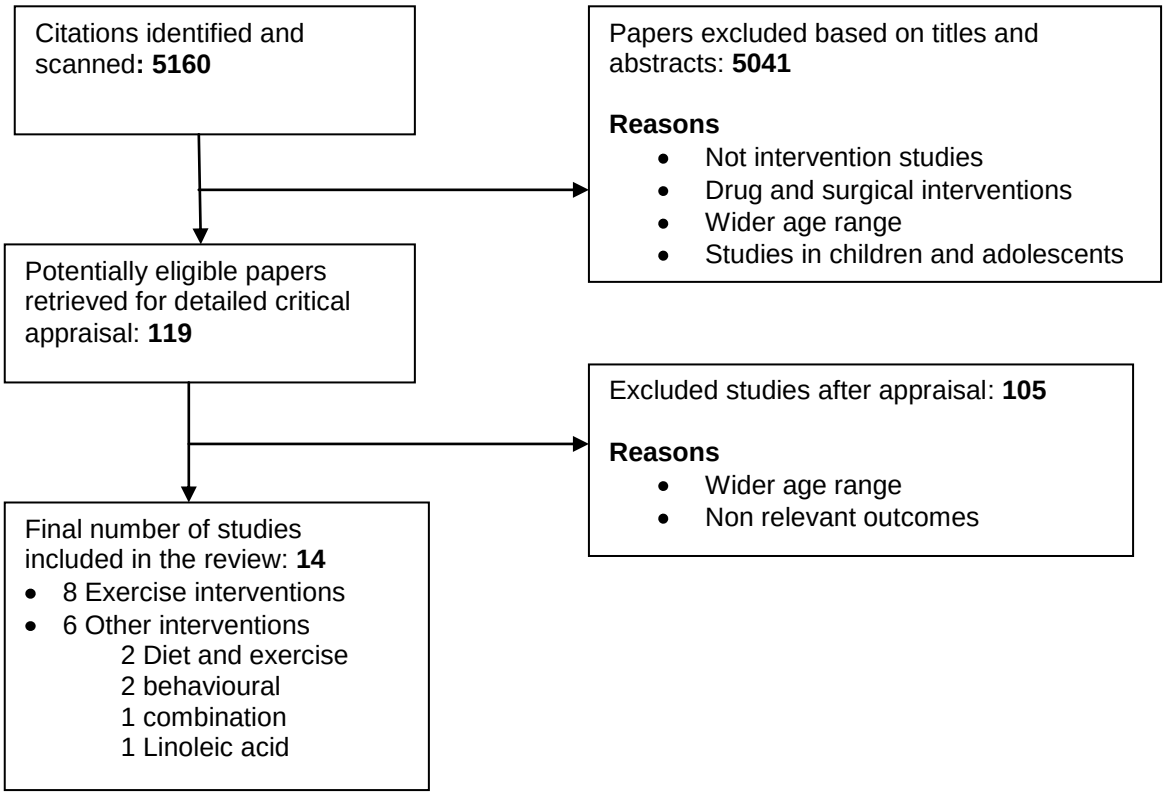
All statistical analyses were performed using SPSS version 17. Some studies presented summary statistics such as means with standard errors (SE). In such cases standard deviations (SD) were derived using the formula: **$SD = SE \times \sqrt{n}$**. In some instances the results were presented in different units, for example, some presenting in conventional units and some in SI (Systeme' Internationale) units. To be consistent, all the values were converted from SI units to conventional units (Appendix 1.3, pg 269). The study by Raz (Raz 1988) did not report weight but reported mean BMI along with mean height. From the given data, the study mean difference in weight and the associated SD were estimated. In one study (Schmidt, Biwer, & Kalscheuer 2001), the SD for the post value of the maximum oxygen uptake was estimated from the graph as this detail was not numerically presented in the paper and the authors did not respond to requests for further information. All available weight measures and other health outcomes were standardised and entered into SPSS as mean with standard deviations (SDs), in their conventional units.

2.2 Results of the literature search

2.2.1 Description of the included studies

The systematic search identified 5160 abstracts of which the full texts of 119 potentially eligible articles were critically appraised. From these, 14 studies met the inclusion criteria and were included in the review. The results of the literature search and the selection process are presented in Figure 2.1.

Figure 2.1 Flow diagram of the selection process for the review



Eight were exclusively exercise interventions (Eliakim et al. 2000;Fernandez et al. 2004;Hara et al. 2005;Kim & Park 2006;Kondo, Kobayashi, & Murakami 2006;Mayo, Grantham, & Balasekaran 2002;Raz 1988;Schmidt, Biwer, & Kalscheuer 2001). Of the other six studies, two were diet and exercise interventions (Hazama et al. 1994;Leidy et al. 2007); two were exclusively behavioural /motivational interventions (Ames et al. 2005;Oka 1998); one study was a combination intervention that had components of diet, physical activity and behavioural skills (Eiben & Lissner 2006) and one study looked at conjugated linoleic acid (Eyjolfson, Spriet, & Dyck 2004). The study details and basic characteristics of the included studies are listed in the Table 2.1.

Table 2.1 Study details and baseline characteristics of included studies

a. EXERCISE INTERVENTIONS						
Author, Year and Country	**Sample size**	**Age and Sex of participants**	**Initial BMI or body weight**	**Type of Intervention**	**Duration and follow-up of interventions**	**Outcome measures**
Kim H-D et al 2006 Korea(In Korean)	Total=44 E: 20 C: 24	**Age**: Range 18-23 years **Sex :** All females	BMI: Mean±sd E: 22.52 ±1.57 C: 21.71±1.75	E: Aerobic exercise with muscular strength exercises C: No exercise intervention	Three to five times a week for **12 weeks** No Follow-up	Body weight, BMI, Fat mass (kg), % Body fat, Lean body mass(kg)
Kondo T et al 2006 Japan	Total=16 E: 8 C: 8	**Age**: Mean±sd E: 18.0±1.0 C: 18.0±1.5 **Sex :** All females	BMI: Mean±sd E: 29.5±2.7 C: 21.9±3.2	E: Aerobic Endurance exercise in obese females C: No intervention	**28 weeks** No Follow-up	Body weight, BMI, Body fat mass (kg), % Body fat, Lean body mass (kg), Total cholesterol, HDL cholesterol, Glucose, Insulin and Maximum Oxygen Uptake (VO_{2max})
Hara T et al 2005 Japan	Total=21 E1: 7 E2: 7 C: 7	**Age**: Mean±sd E1: 19.7±1.3 E2: 18.4±0.5 C: 19.4±1.0 **Sex:** All males	BMI: Mean±sd E1: 29.9±1.8 E2: 29.9±3.8 C: 33.5±5.6	E1: Aerobic exercise training E2: Aerobic exercise + Resistance exercise training C: No exercise intervention	E1- 3 times/week for **8 weeks** E2-2-3 times a week for **20 weeks** No Follow-up	Body weight, BMI, Body fat mass(kg), % Body fat, Total cholesterol, HDL cholesterol, Glucose, Insulin and Maximum Oxygen uptake(VO_{2max})
Fernandez AC et al 2004 Brazil	Total =28 E1: 10 E2: 9 C: 9	**Age:** Mean±sd E1: 16.7±1.5 yrs E2: 15.83±0.75 yrs C:16±1.32 yrs **Sex:** Only males and obese	Body weight (kgs): Mean±sd E1: 101±11 kgs E2: 99±13kgs C: 98±14 kgs	E1: Anaerobic exercise training E2: Aerobic training C: No exercise All had nutritional orientation and consultation with nutritionist every month	**12 weeks** No Follow-up	Body weight, BMI, Body fat mass (kg), % Body fat
Mayo MJ et al 2002 Singapore	Total=60 E: 30 C: 30	**Age:** Mean±sd E: 19.8±0.6 C: 19.2±1.3 **Sex:** Only males and obese	BMI: Mean±sd E: 31.6±2.8 C: 34.1±4.0	E: Aerobic exercise - Basic Military training C: No specific exercise training	780, one hour training periods for **16 weeks** No Follow-up	Body weight, BMI, Body fat mass(kg); % Body fat; Fat free mass or lean body mass (kg)
Schmidt WD et al 2001 USA	Total=48 E1: 12 E2: 12 E3: 12 C: 12	**Age:** Mean ±sd E1: 20.7±2.5 E2: 18.3±0.48 E3: 19±0.93 C: 20.8±1.6 **Sex:** All obese females	BMI: Mean ±sd E1: 31.2±3.8 E2: 30.4±3.3 E3: 32.6±3.9 C: 31.4±2.5	E1: Aerobic exercise (1x 30min daily) E2: Aerobic exercise (2x 15 min daily) E3: Aerobic exercise (3x10min daily) C: No exercise	5 days a week for **12 weeks** No Follow-up	Body weight, BMI and Maximum Oxygen uptake (VO_{2max})
Eliakim A et al 2000(Eliakim et al. 2000) USA	Total= 44 E: 22 C: 22	**Age**: Mean±sd E: 16±3.3 C: 16±3.3 **Sex:** Both sexes	Body weight (kg): Mean±sd E: 61.0±8.4 C: 62.2±16.4	E: Aerobic endurance exercise training C: No exercise	2-2.5 hours a day/5 days a week for **5 weeks** No Follow-up	Body weight, Total cholesterol, HDL cholesterol
Raz I et al 1988	Total=55 E: 27	**Age:** Mean ±sd E: 24.7±0.8 yrs	BMI (range) E: 22.6±2.3	E: Aerobic exercise intervention	**9 weeks** No Follow-up	BMI, HDL cholesterol, Glucose, Insulin, Maximum Oxygen uptake (VO_{2max})

Israel	C: 28	C: 25.0±0.8yrs **Sex:** All males	C: 23.1±2.0	C: Not to change exercise during study period		
b. OTHER INTERVENTIONS						
Author, Year and Country	**Sample size**	**Age and Sex of participants**	**Initial BMI or body weight**	**Type of Intervention**	**Duration and follow-up of interventions**	**Outcome measures**
Leidy HJ et al 2004 and **2007** USA	Total=22 and 12 E: 15 ; **8** C: 7 ; **4**	**Age:** Mean±sd E: 20±3.9yrs C: 20±2.6 yrs **Sex:** All females	BMI: Mean±sd E: 21.9±2.3 C: 20.7±1.5	**Combination (Diet and Exercise)** E: Energy deficit group (negative energy balance ranging from -30% to -60%) C: No exercise and consumed enough to maintain weight	**12 weeks** No Follow-up	Body weight, BMI, Body fat mass(kg), % Body fat, Fat free mass or lean body mass (kg) and Maximum Oxygen uptake (VO_{2max})
Eiben G et al 2006 Sweden	Total=40 E: 18 C: 22	**Age:** Mean ±sd E: 22.7 ±2.5; C: 22.3±2.8 **Sex:** All females	BMI: Mean ±sd E: 28.1±5.9 C: 25.9±5.6 One of their parents were obese	**Combination (Diet, Exercise and behaviour)** E: Health Hunters: Package with 3 themes-Physical Activity, diet and behavioural skills for weight control C: No intervention	**52 weeks** No Follow-up	Body weight, BMI, % Body fat, Lean body mass
Ames GE et al 2005 USA (PILOT STUDY)	Total =67 E: NR C: NR	**Age:** Mean±sd E: 21.5±2.2 yrs C: 21.5±2.2 yrs **Sex:** All females	BMI: Mean ±sd E: 31.1±2.9 C: 31.1±2.9	**Behavioural and motivational intervention** E: Standard Behavioural intervention with restricted diet and exercise- 10 sessions + reformulated cognitive behavioural intervention-10 sessions C: Standard Behavioral intervention with restricted diet and exercise - 20 sessions	Duration not reported had 20 sessions Follow-up 24 weeks	Body weight, Self esteem, Beck depression inventory, self confidence (MWLQ-Motivations for weight loss questionnaire)
Eyjolfson E et al 2004 Canada	Total=16 E: 10 C: 6	**Age:** Mean±sd E: 21.4±1.6 C: 21.6±1.9 **Sex:** Both sexes (F=12; M= 4)	BMI: Mean ±sd E: 26.9±4.7 C: 28.4±7.3	**Conjugated Linoleic Acid** E: Conjugated Linoleic Acid capsules C: Placebo capsule with Safflower oil	**8 weeks** No Follow-up	Body weight, BMI, % Body fat, Glucose and Insulin
Oka M et al 1998 Japan (Japanese paper)	Total=22 E: 11 C: 11	**Age:** Mean ±sd E: 20.9±2.6 C: 20.0±0.0 **Sex:** All females	Body weight (kg) Mean ±sd E: 57.9±9.8 C: 57.8±6.8	**Behavioural and motivational intervention** E: Motivational intervention: Enhance self-efficacy and desire for weight control C: Knowledge based: Only lectures	**2 weeks** No Follow-up	Body weight, % Body fat , Self efficacy and Desire for weight control

Hazama et al 1994 Japan	Total=16 E: 10 C: 6	**Age:** Mean ±sd Range 18-24 years E: 20.7±1.4yrs C: 20.9±1.7 yrs **Sex:** All females	BMI (range) E: 25.0 - 29.9 C: 25.0 - 29.9	**Combination (Diet and Exercise)** E: Aerobic exercise program plus dietary advice C: No intervention	**15 weeks** No Follow-up	Body weight, Body fat mass (kg), % Body fat, Fat free mass or lean body mass (kg), Total cholesterol, HDL cholesterol and Maximum Oxygen uptake (VO_{2max})

E: Experimental group; C: Control group: NR: Not reported

The sample sizes of the studies were relatively small ranging from 16-67. Most of the studies were single gender; eight with only females (Ames et al. 2005;Eiben & Lissner 2006;Hazama et al. 1994;Kim & Park 2006;Kondo, Kobayashi, & Murakami 2006;Leidy et al. 2007;Oka 1998;Schmidt, Biwer, & Kalscheuer 2001), four only males (Fernandez et al. 2004;Hara et al. 2005;Mayo, Grantham, & Balasekaran 2002;Raz 1988) while two studies had both (Eliakim et al. 2000;Eyjolfson, Spriet, & Dyck 2004). Out of the eight exercise intervention studies, four studies had only male participants (Fernandez et al. 2004;Hara et al. 2005;Mayo, Grantham, & Balasekaran 2002;Raz 1988), three had only females (Kim & Park 2006;Kondo, Kobayashi, & Murakami 2006;Schmidt, Biwer, & Kalscheuer 2001) and one study had both (Eliakim et al. 2000). In comparison, out of the other six interventions which had diet, physical activity and cognitive behavioural components, five studies were conducted only in females (Ames et al. 2005;Eiben & Lissner 2006;Hazama et al. 1994;Leidy et al. 2007;Oka 1998) and one study had both sexes (Eyjolfson, Spriet, & Dyck 2004).

While the interventions were delivered over periods ranging from 2 weeks (Oka 1998) to 52 weeks (Eiben & Lissner 2006), most interventions lasted for 2-6 months and most commonly for 12 weeks. Outcomes were always assessed immediately after the intervention except for one study (Ames et al. 2005) which also had a follow up of 6 months after the completion of intervention. On the methodological quality assessment, most of the studies were scored to be 'moderate' in quality with only 2 studies scoring as 'good' (Eiben & Lissner 2006;Leidy et al. 2007) and the other two as 'weak' (Hazama et al. 1994;Mayo, Grantham, & Balasekaran 2002). All the studies and results as presented in the original papers are summarised in Appendix 1.4 and 1.5, pgs 270 and 278

Most of the studies were classified as controlled trials. However, in one study the control group were people of normal weight making them non-comparable (Kondo, Kobayashi, & Murakami 2006). In other studies (Mayo, Grantham, & Balasekaran 2002;Raz 1988), the control groups were significantly different to the experimental group at baseline also making them non-comparable. Of the remaining studies which did have comparable control groups,

four studies (Eiben & Lissner 2006;Leidy et al. 2007;Oka 1998;Schmidt, Biwer, & Kalscheuer 2001) provided the change over time data for both intervention and the control groups. However they did not provide any data for further comparison between the groups. Consequently, in order to compare the effectiveness of the intervention versus control, estimated information about changes over time between intervention and control groups would have been required, a process which with several levels of estimation reduces credibility. Hence, for this review any study group which received an intervention (even if the original paper called this a control group) was considered longitudinally. This approach can be further justified since most of the studies themselves compared before and after the intervention rather than comparing the experimental group with the control group (Appendix 1.4 and 1.5, pgs 270 and 278). Given the lack of suitable controls in most studies, all study groups were analysed as before and after comparisons, consequently the 14 studies provided a total of 20 study groups.

2.3 Changes to the method of statistical analysis

2.3.1 Imputing data

Before and after comparisons require differences between baseline and follow-up as paired differences with associated precision. When not provided, suitable estimates for mean differences and their associated standard deviations (SD) were derived. Mean differences were estimated using the difference between the given means at baseline and at follow-up.

e.g. For weight: - PremeanWeight + Postmeanweight

Their associated standard deviations (SD) were estimated using $SD_D = \sqrt{SD_F^2 + SD_B^2}$ where suffixes *D* denotes difference while *F* and *B* represent follow-up and baseline respectively.

Theoretically, the variance of paired differences would be $\sigma_D^2 = \sigma_F^2 + \sigma_B^2 - 2\sigma_{FB}$, where σ_{FB} is the variance within an individual between the baseline and the follow-up, which is usually unknown. Consequently, without making any assumptions about the co-variance and since only estimates of the baseline and follow-up variances are known, the proposed estimate SD_D is a conservative measure.

2.3.2 Meta-analysis

Body weight and the health outcomes were weighted by the inverse of the variance of their respected mean difference. Consequently the overall weighted mean differences of body weight and various health outcomes from all studies were estimated. The test for heterogeneity was carried out based on the Q statistic which is approximately distributed by chi-square distribution with k-1 degrees of freedom (Sutton AJ et al. 1998a). If the Q statistic is greater than the critical value of the chi-square distribution, assessed by a significance of $p<0.05$, then the observed variance in the study effect sizes is significantly greater than that expected by chance. In such cases the homogeneity assumption is rejected to conclude that heterogeneity is present. Hence where possible suitable meta-analysis was conducted using either a fixed effects model for homogenous studies or random effects model for heterogeneous studies.

2.3.3 Meta regression

Meta linear regression models were also developed to assess the association of health outcomes with weight status. Each health outcome was weighted by the inverse of its variance. Meta-regression models were constructed using weighted least squares (WLS) regression whereby the health outcome changes were predicted from the mean weight changes. The standard error (SE) of the respective health outcomes were used as model weights defined as $1/SE^2$. The resulting estimated regression coefficients further required their standard errors to be adjusted (Sutton AJ et al. 1998a). Only then can the significance of each coefficient within each meta-regression model be determined.

2.4 Results of the literature review

2.4.1 Description of the study groups

The 20 study groups from 14 studies were included in the review, details of which (as before and after comparisons) are presented according to the type of interventions: Exercise interventions in Appendix 1.6, pg 284 and all the other interventions in Appendix 1.7, pg 289. Most of the exercise interventions were aerobic in nature (10 study groups) with only one study group each assessing aerobic with resistance exercise and anaerobic exercise. The nature of the aerobic exercises and the duration varied among the studies ranging from jogging, rope skipping, soccer, basketball to treadmills and mild cycle ergometers. Aerobic with resistance exercise (Hara et al. 2005) added on components of resistance such as shoulder press-ups, squat, arm and leg curls, bench press ups etc. The anaerobic exercises study (Fernandez et al. 2004) had intensive interspaced training with a series of cycle ergometer with an interval of active recovery for 3 minutes (walking) between series. The motivational/behavioural interventions ranged from standard behavioural treatment (training in self-monitoring, social support and goal setting), group lectures, individual/group counselling to reformulated cognitive behavioural techniques(establishing realistic weight goals, expectations for weight loss, correcting faulty assumptions about appearance, valuing

aspects of self unrelated to health). The details of the intervention components are presented in Appendix 1.4 and 1.5, pgs 270 and 278.

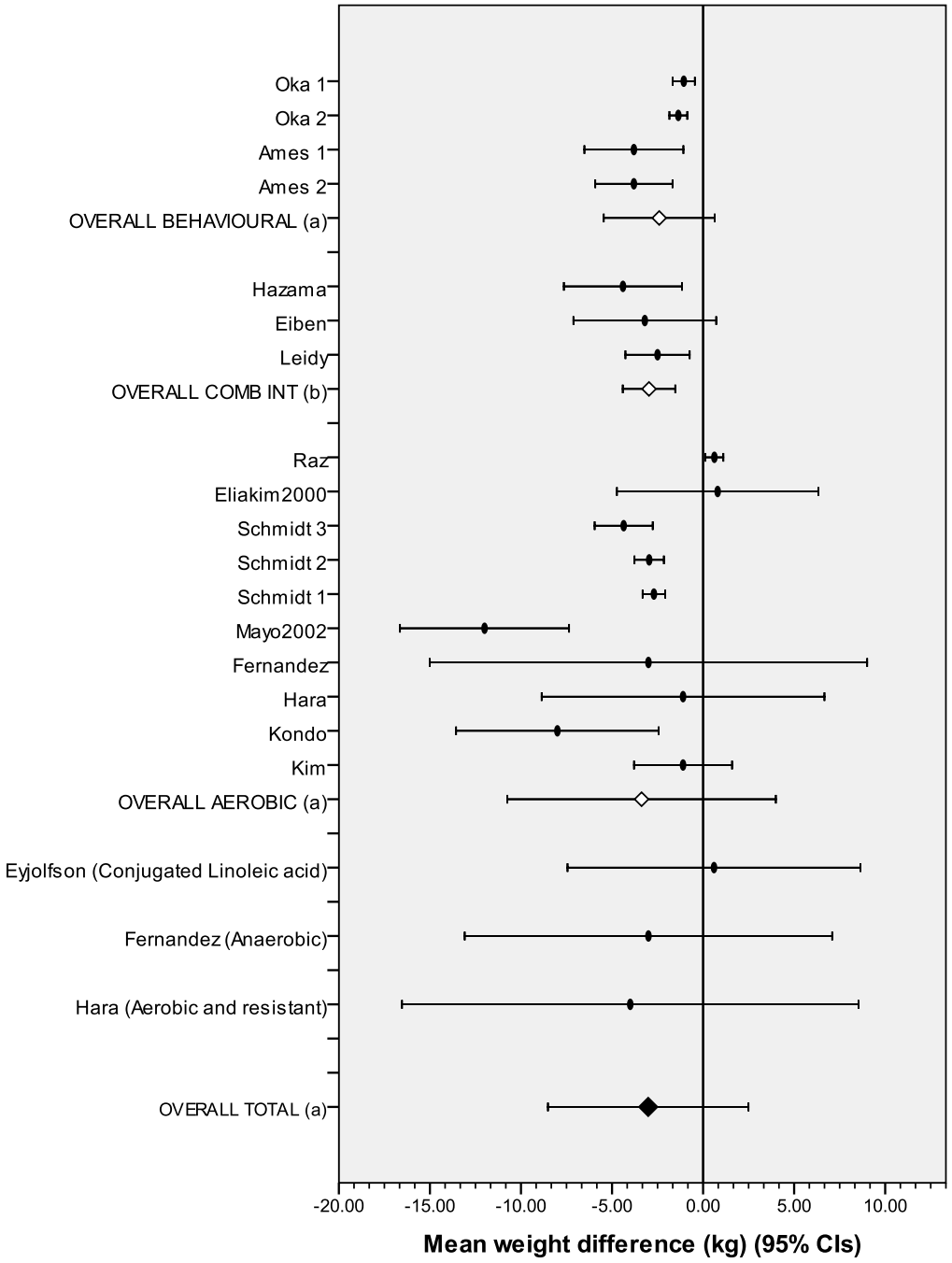
The 20 study groups were grouped into six categories according to intervention type: Aerobic exercise (10 study groups), Aerobic with resistance exercise (one study group), Anaerobic exercise (one study group), Conjugated Linoleic acid (one study group), Combination interventions (three study groups) and Behavioural and motivational interventions (four study groups). Although the same type of interventions were grouped together (for example, 10 aerobic and four behavioural study groups), they still differed with respect to intervention components, delivery and duration of intervention (Appendix 1.4 and 1.5, pgs 270 and 278). This, along with the fact that anaerobic exercise, aerobic with resistance exercise and conjugated Linoleic acid interventions were all single studies, made head-to-head comparison of one intervention type with another inappropriate. Consequently, the changes in measurements of obesity (body weight, BMI, fat mass, % body fat and lean body mass) and other health outcomes (total cholesterol, HDL cholesterol, Insulin, glucose, and maximum oxygen uptake) were each assessed by intervention type. Meta combinations based on either fixed effects model for the homogenous studies or random effects model for the heterogeneous studies (Sutton AJ et al. 1998b) were conducted for all of these outcome measures.

2.4.2 Changes in obesity measures according to the type of interventions

2.4.2a Body weight changes (Figure 2.2): All the study groups (14 studies) except Raz (Raz 1988) gave body weight measures. The study by Raz only gave BMI and height from which a mean difference for weight was estimated (see 2.1.6, page 25). A meta combination based on a random effects model (due to heterogeneous nature of all the study groups) showed, that on average the mean weight loss among young people was a non significant -3.01 kgs (95% CI -8.5 to 2.5). When broken down into the different type of interventions, then interventions that combine diet, exercise and motivational skills showed a significant weight loss with narrower confidence intervals (-2.97 kgs; 95%CI -4.4 to -1.5; fixed effects model).

Although the individual behavioural and motivational interventions showed significant weight loss, overall it was non-significant (-2.41 kgs; 95% CI -5.5 to 0.6, based on a random effects model). The effect of aerobic exercise interventions (based on a random effects model) on body weight was non-significant. While five aerobic study groups (three studies) showed significant weight loss change, three showed non-significant results with wide confidence intervals and two study groups showed a non-significant increase. One other study that showed a weight gain was the conjugated lineoleic acid intervention (+0.6kgs ±12.9) by Eyjolfson (Eyjolfson, Spriet, & Dyck 2004). Two of the single study interventions, aerobic and the resistance exercise and anaerobic exercise intervention (Hara et al. 2005) (Fernandez et al. 2004) also showed weight losses with limited interpretation given their wide confidence intervals.

Figure 2.2 Mean weight change by intervention

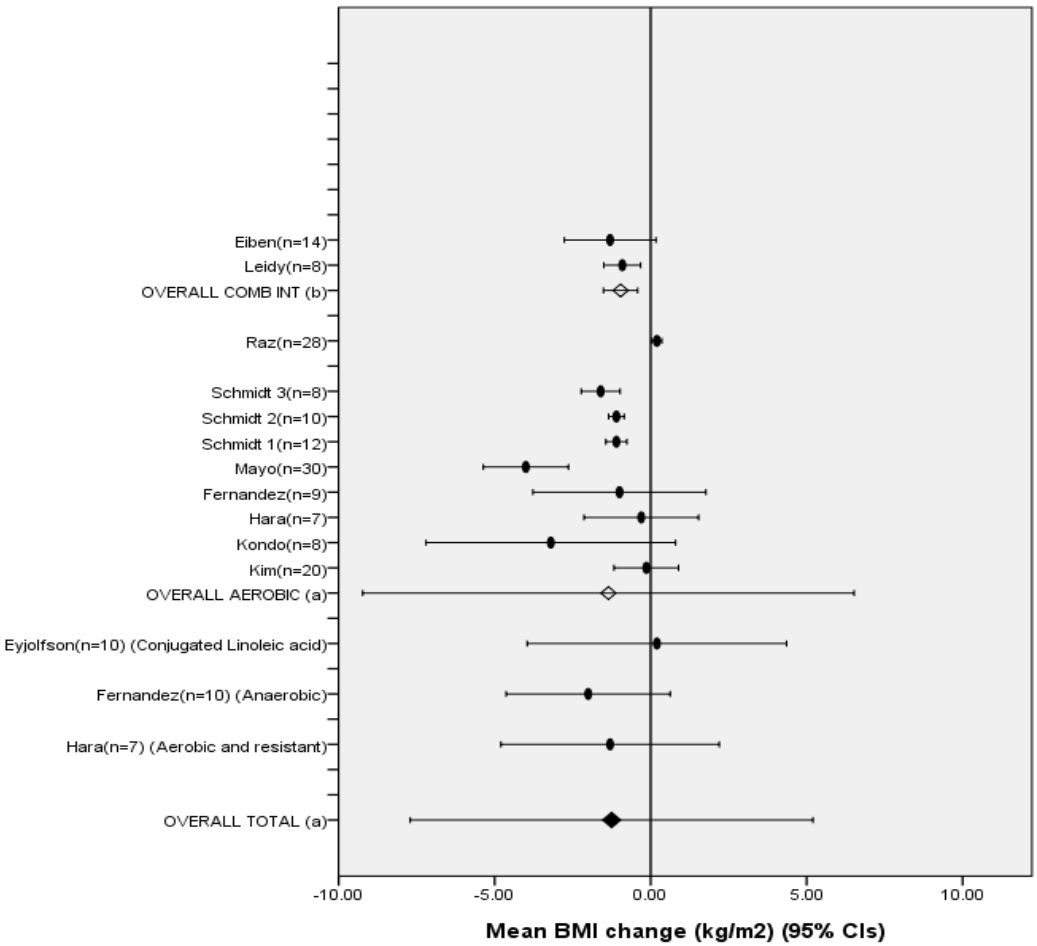


(a): Random effects model for heterogeneous studies; (b): Fixed effect model for homogenous studies)

2.4.2b Body Mass Index (BMI) changes (Figure 2.3): There were 14 study groups from 10 studies that measured BMI. A meta combination of all the study groups using random effects model, again showed that on average the mean BMI change among young people, was non-significant -1.25 kg/m^2 (95% CI -7.7 to 5.2). Although based on only two study groups, interventions that combined diet, exercise and motivational skills (using fixed effects model) showed a significant change of -0.96 kg/m^2 (95%CI -1.5 to -0.4) with a narrow confidence

interval. Similar to body weight changes, aerobic exercise interventions, showed an overall non-significant mean BMI loss of-1.35 kgs/m^2 (95% CI -9.2 to 6.5; random effects model). This could again be because, most of the individual aerobic study groups either showed small BMI changes and/or had wide confidence intervals except the study by Mayo (Mayo, Grantham, & Balasekaran 2002).Two of the single study interventions (Fernandez et al. 2004;Hara et al. 2005) also showed BMI loss, but interpretations of these were limited given their wide confidence intervals.

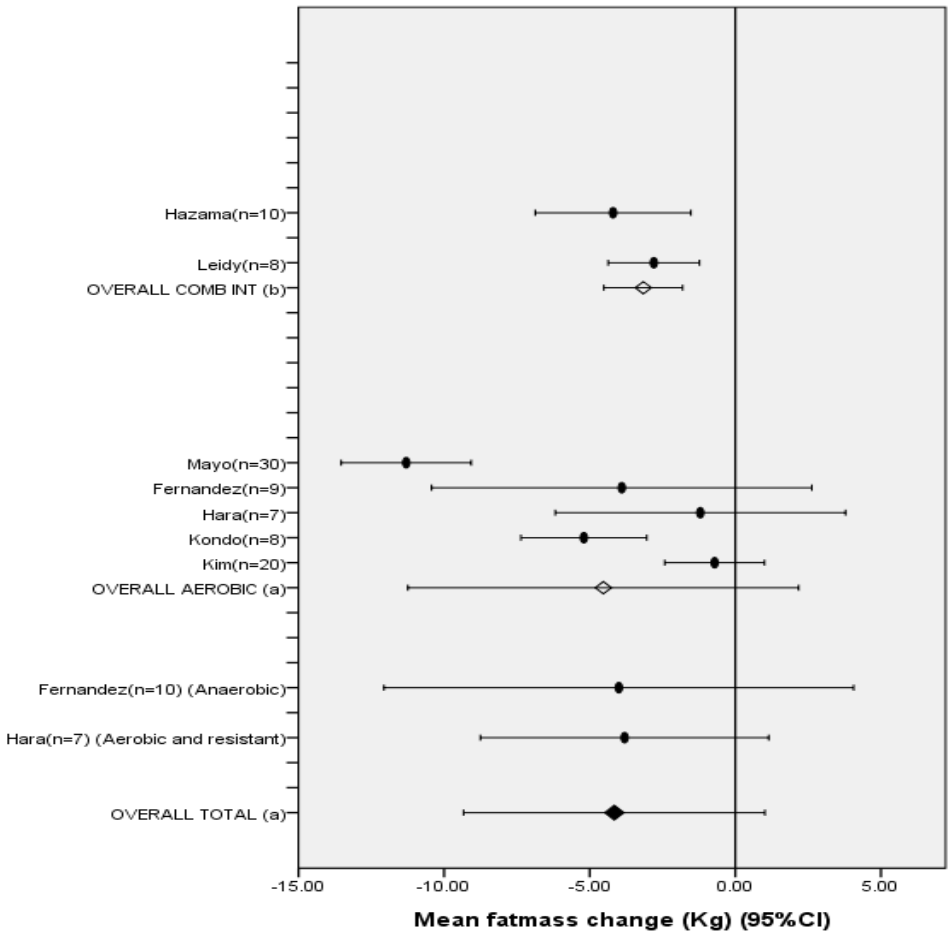
Figure 2.3 Mean BMI change by intervention



a: Random effects model; b: Fixed effects model

2.4.2c Fat mass changes (Figure 2.4): Body fat mass was measured by nine study groups (seven studies). When all the studies were considered together (using a random effects model) the average mean loss of body fat mass among young people, was a non-significant -4.16 kgs (95% CI -9.3 to 1.0). However, when split into different types of interventions, those that combined diet, exercise and motivational skills showed a significant loss in fat mass of -3.16 kgs (95%CI -4.5 to -1.8) using a fixed effects model albeit this was based on only two study groups. Aerobic exercise interventions, when combined using a random effects model, showed a mean fat mass loss of -4.53 kgs, but had a wide confidence interval of -11.2 to 2.2, again probably confounded by small sample sizes.

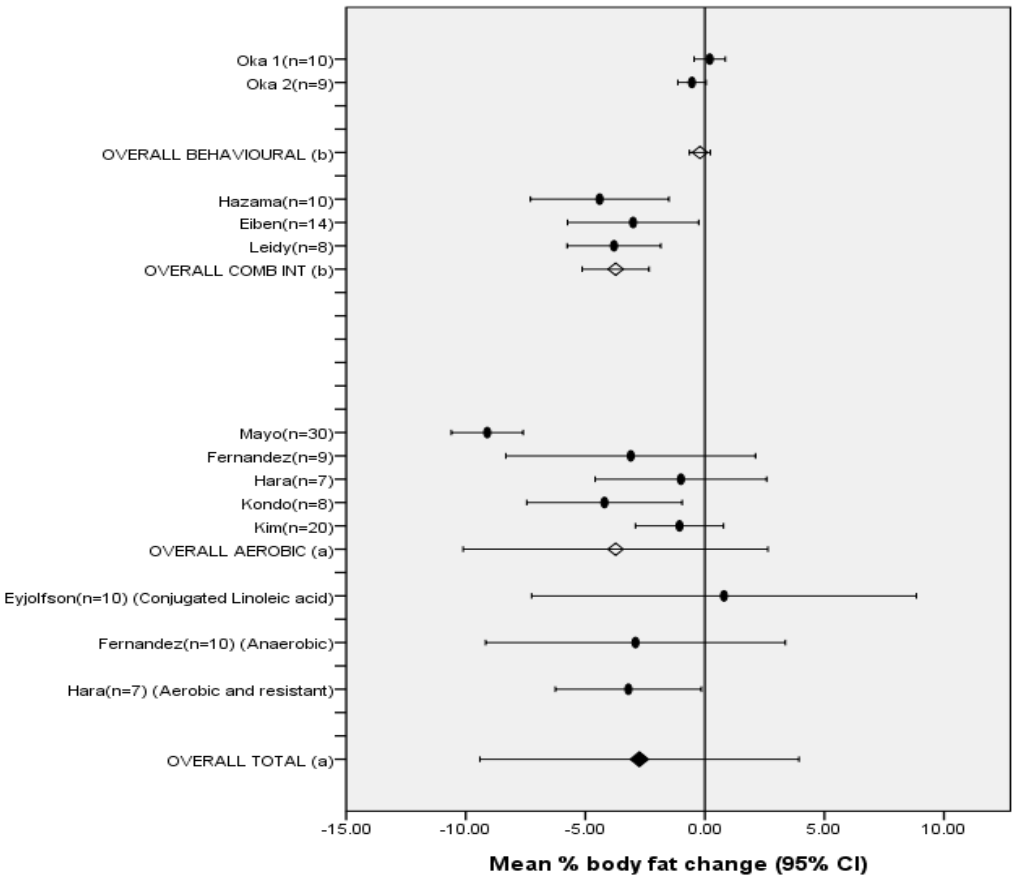
Figure 2.4 Mean fat mass change by intervention



a: Random effects model b: Fixed effects model

2.4.2d Percentage body fat changes (Figure 2.5): Percent body fat is the percentage of the total body composition that is fat.13 study groups from 10 studies measured % body fat. A meta combination (based on random effects model) of all the study groups showed, that on average the mean change in % body fat among young people to be a non significant -2.74% (95% CI -9.4 to 3.9). However, the effect of combination interventions on % body fat indicated a significant loss using a fixed effects model (-3.73%; 95%CI -5.1 to -2.3). Aerobic exercise interventions (random effects model), while showing a loss of -3.73% of body fat change was non-significant (CI -10.1 to 2.6) with wide confidence intervals. Behavioural interventions (two study groups) and the two single study interventions all showed non-significant results.

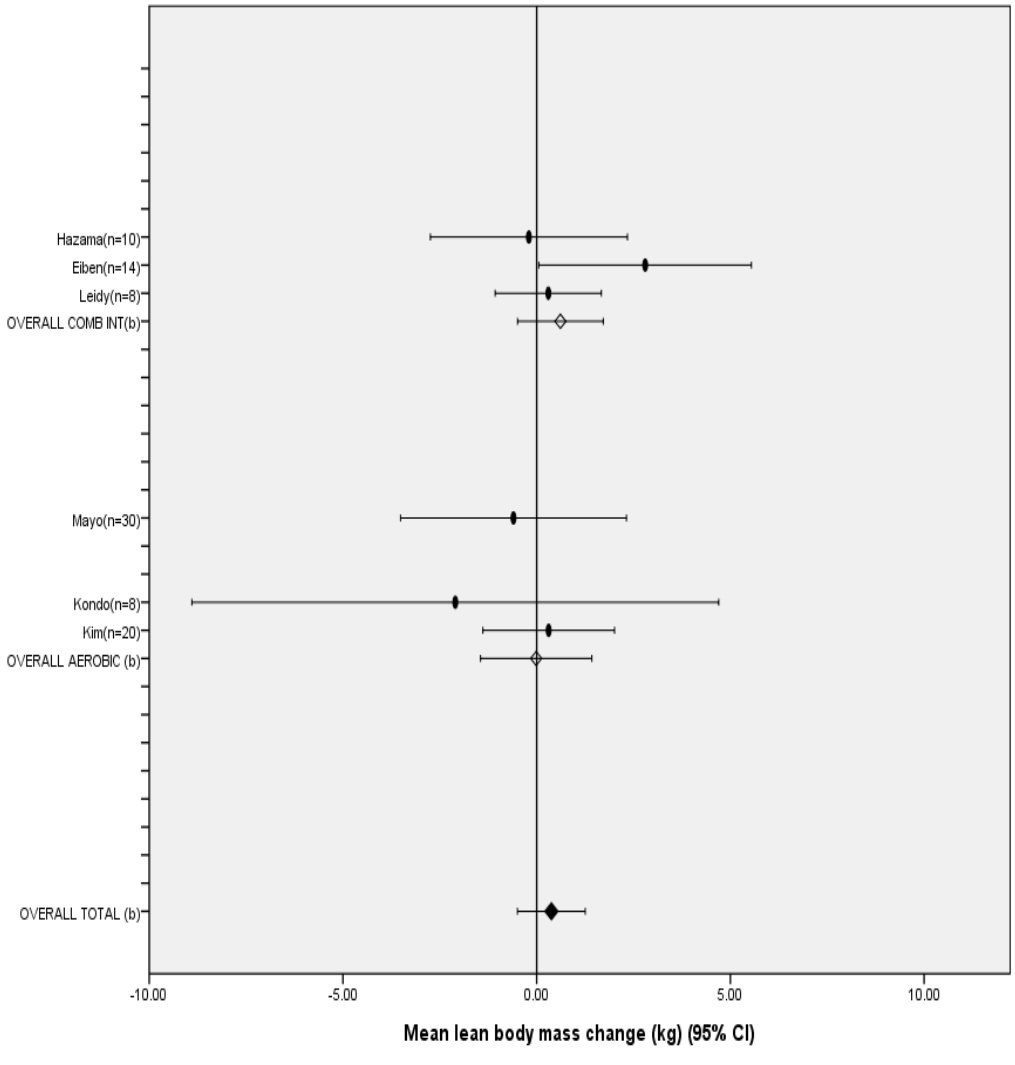
Figure 2.5 Mean percentage body fat change by intervention



a: Random effects model; b: Fixed effects model

2.4.2e Lean body mass changes (Figure 2.6): Lean body mass is also known as fat free mass. This measures all the body tissue (sum of weight of bones, muscle and organs) except the stored fat. Lean body mass was considered only by six study groups (six studies). A meta combination of all the six study groups was a statistically non-significant increase in lean body mass (0.38 kgs (95% CI -0.5 to 1.3) using a fixed effects model. Even when broken down by intervention group, all types showed non-significant small changes in lean body mass.

Figure 2.6 Mean lean body mass change by intervention



a: Random effects model; b: Fixed effects model

In summary, considering all the intervention types together, there were non-significant reduction in body weight, BMI, fat mass and % body fat and a small non-significant increase in the lean body mass. Assessing the effect of the different types of intervention indicates that combination interventions with diet, physical activity and behavioural components resulted in statistically significant reductions in body weight, BMI, fat mass and % body fat and a small non-significant increase in the lean body mass. However, the effectiveness of the combination interventions were based on a small number of study groups with small sample sizes as highlighted in the figures. Aerobic interventions with the larger number of study groups, although showing improvements in all the measures, had wide confidence intervals limiting their clinical importance (Table 2.2). This could be because of small sample sizes except for the study by Mayo (Mayo, Grantham, & Balasekaran 2002) which had a bigger sample size with narrower CI. It is worth noticing that this study was conducted among military recruits where the variance would be virtually nonexistent.

Table 2.2 Changes in obesity measures by type of interventions

	Type of interventions			
Outcomes	**Overall change**	**Aerobic**	**Combination**	**Behavioural**
Body weight (kgs)	***N=20 (n=299)*** -3.01 kgs (-8.5 to 2.5)	***N=10 (n=154)*** -3.38 kgs (-10.8 to 3.9)	***N=3 (n=32)*** -2.97 kgs (-4.4 to -1.5)	***N=4 (n=86)*** -2.41 kgs (-5.5 to 0.6)
Body Mass Index	***N=14 (n=181)*** -1.25 kg/m^2 (-7.7 to 5.2)	***N=9 (n=132)*** -1.35 kg/m^2 (-9.2 to 6.5)	***N=2 (n=22)*** -0.96 kg/m^2 (-1.5 to -0.4)	No studies
Fat mass (kgs)	***N=9 (n=109)*** -4.16 kgs (-9.3 to 1.0)	***N=5 (n=74)*** -4.53 kgs (-11.2 to 2.2)	***N=2 (n=18)*** -3.16 kgs (-4.5 to -1.8)	No studies
% Body fat	***N=13 (n=152)*** -2.74% (-9.4 to 3.9)	***N=5 (n=74)*** -3.73% (-10.1 to 2.6)	***N=3 (n=32)*** -3.73 % (-5.1 to -2.3)	***N=2 (n=19)*** -0.21% (-0.6 to 0.2)
Lean body mass	***N=6 (n=90)*** 0.38 kgs (-0.5 to 1.3)	***N=3 (n=58)*** -0.01 kgs (-1.5 to 1.4)	***N=3 (n=32)*** 0.61 kgs (-0.5 to 1.7)	No Studies

(Parentheses is 95% confidence intervals); N is number of study groups

Interpretation of the effects of behavioural/motivational interventions is limited due to few study groups assessing this intervention (four study groups on body weight and two study groups on % body fat) with non-significant results. Comparison between the intervention types for successful weight loss was not possible given the reduced number of study groups.

In addition the interventions varied widely in their components and duration making comparisons of interventions inappropriate.

2.4.3 Changes in health outcomes by type of interventions

Some of the studies also assessed the effects of the interventions on various health outcomes. Total cholesterol, HDL cholesterol, blood glucose, insulin and maximum oxygen uptake were the health outcomes considered for analysis in this review. Five study groups each assessed change in total cholesterol, insulin and glucose. Six study groups assessed HDL cholesterol changes and nine study groups assessed maximum oxygen uptake (Table 2.3). As with the obesity measures, overall changes in these health outcomes (all interventions together) and then by each intervention type were assessed.

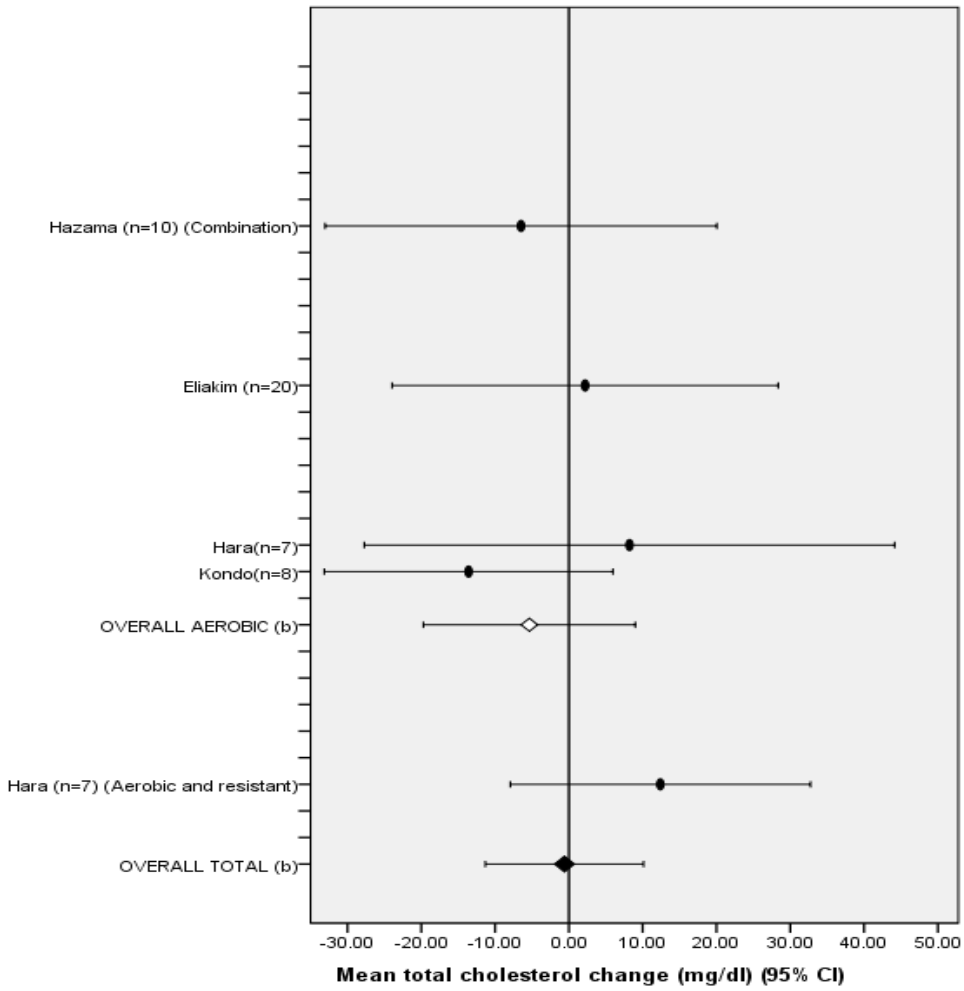
Table 2.3 Changes in health outcomes by type of interventions

	Type of interventions			
Outcomes	**Overall change**	**Aerobic**	**Combination**	**Behavioural**
Total cholesterol	***N=5 (n=52)*** -0.61mg/dl (-11.3 to10.1)	***N=3 (n=35)*** -5.36mg/dl (-19.7 to 9.0)	Only one study group ***(n=10)***	No studies
HDL cholesterol	***N=6 (n=80)*** 4.24 mg/dl (1.1 to 7.4)	***N=4(n=63)*** 1.82 mg/dl (0.1 to 3.6)	Only one study group (***n=10)***	No studies
Insulin	***N=5 (n=60)*** -1.39µU/ml (-2.2 to -0.6)	***N=3 (n=43)*** -1.41µU/ml (-2.3 to -0.5)	No studies	No studies
Glucose	***N=5 (n=60)*** -4.71 mg/dl (-7.4 to -2.0)	***N=3 (n=43)*** -4.69 mg/dl (-7.5 to -1.9)	No studies	No studies
Maximum oxygen uptake	***N=9 (n=98)*** 4.38ml/kg/min (-0.1 to 8.9)	***N=6 (n=73)*** 2.83ml/kg/min (-0.3 to 5.9)	***N=2 (n=18)*** 6.41ml/kg/min (3.8 to 9.0)	No Studies

(Parentheses is 95% confidence intervals); N is number of study groups

2.4.3a Total cholesterol changes (Figure 2.7): Total cholesterol was measured only by five study groups (four studies). A meta combination using a fixed effects model of all the study groups points to a small, non significant reduction of -0.61 mg/dl (95% CI -11.3 to 10.1) in total cholesterol among young people. When split into the effects of different type of interventions, the results were inconsistent with two study groups showing a reduction (Hazama et al. 1994;Kondo, Kobayashi, & Murakami 2006) and three study groups (Eliakim et al. 2000;Hara et al. 2005) showing an increase in total cholesterol.

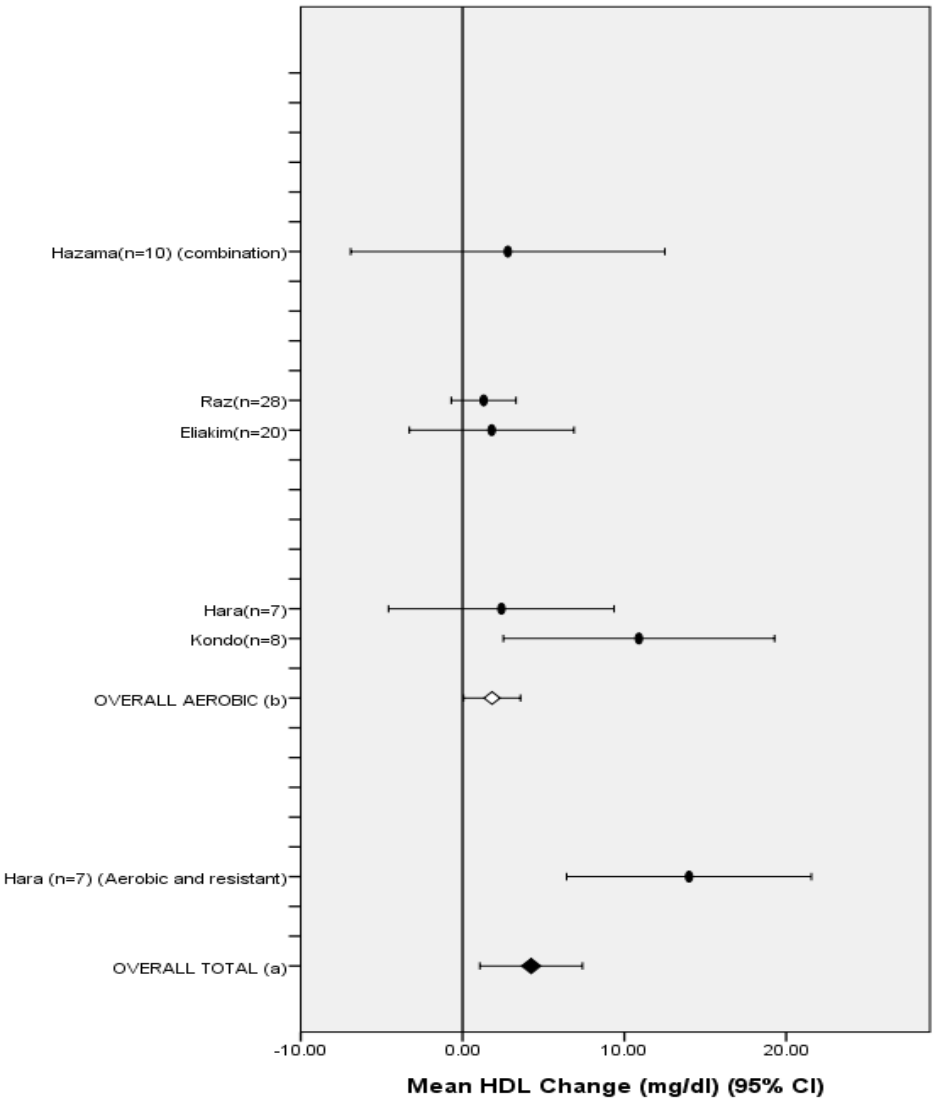
Figure 2.7 Mean total cholesterol change by intervention



a: Random effects model; b: Fixed effects model

2.4.3b HDL cholesterol changes (Figure 2.8): Six study groups (five studies) measured HDL cholesterol. Looking at all the studies together, a meta combination using a random effects model, showed a significant increase in the HDL cholesterol levels (4.24 mg/dl; 95% CI 1.1 to 7.4). Of all the six study groups, only two study groups (aerobic study; and aerobic and resistant exercises) showed a significant increase in HDL cholesterol results while the other four were non-significant results with wide confidence intervals.

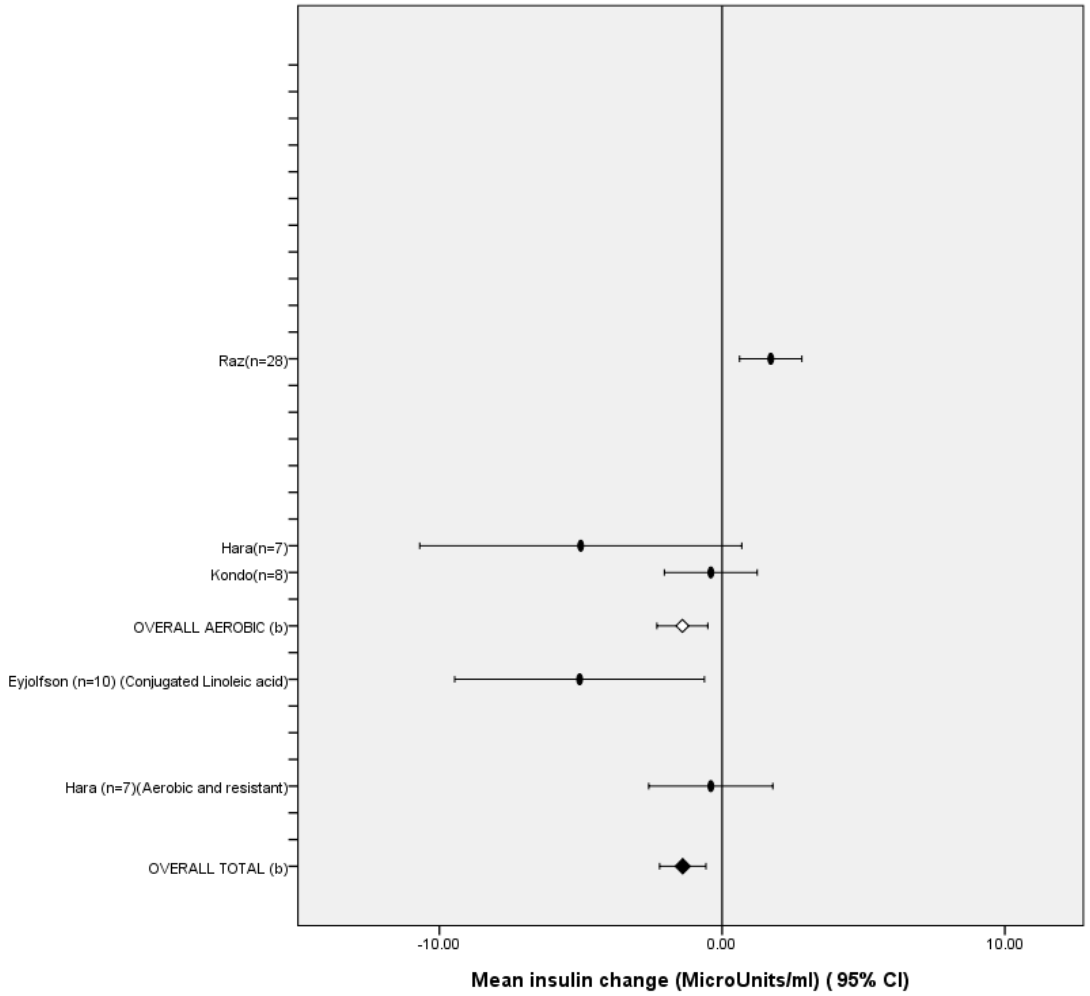
Figure 2.8 Mean HDL cholesterol change by intervention



a: Random effects model; b: Fixed effects model

2.4.3c Insulin changes (Figure 2.9): A meta combination of all the five study groups (four studies) that measured insulin levels showed a significant mean decrease in fasting insulin levels (-1.39μU/ml; 95% CI -2.2 to -0.6) based on a fixed effects model. A single study of conjugated linoleic acid intervention is the only one that showed a significant reduction of -5.04± 7.13μU/ml (Eyjolfson, Spriet, & Dyck 2004). Other studies showed non-significant results except the study by Raz (Raz 1988) which showed a significant increase.

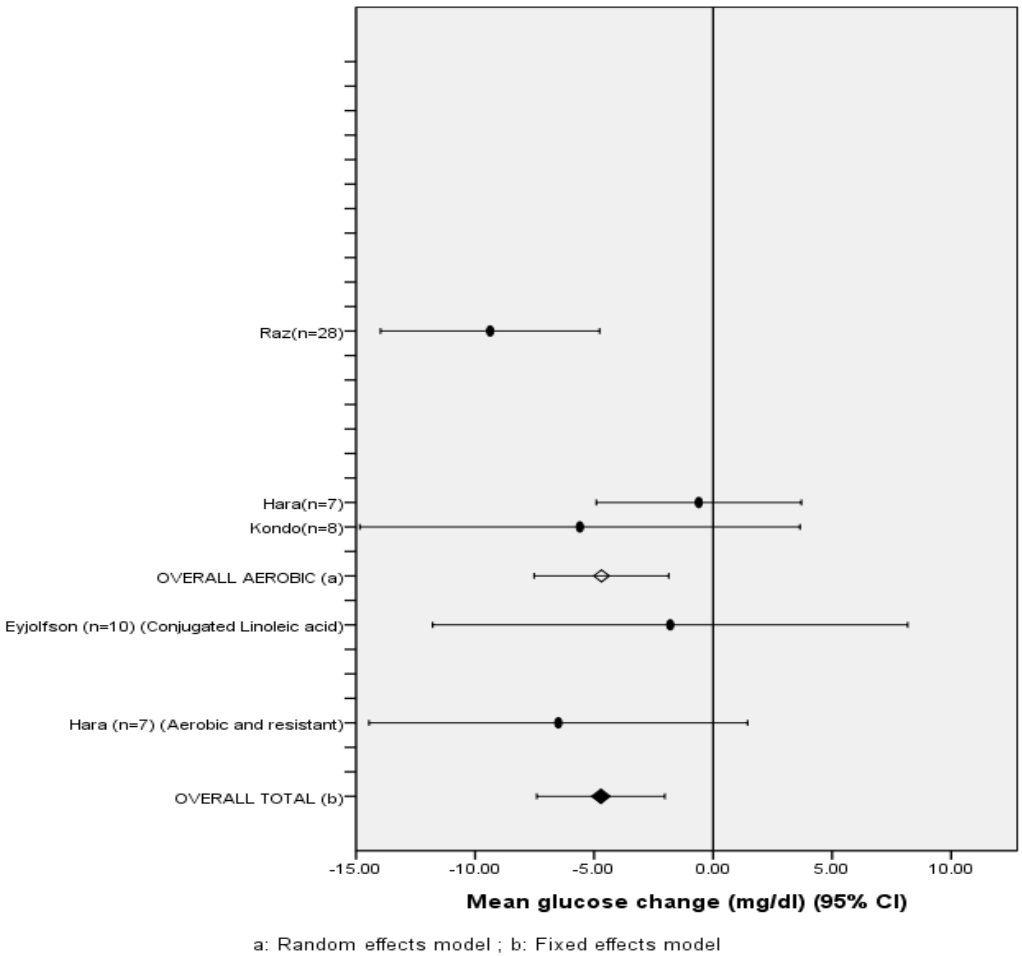
Figure 2.9 Mean insulin change by intervention



a: Random effects model; b: Fixed effects model

2.4.3d Glucose changes (Figure 2.10): Changes in plasma glucose were measured by five study groups (four studies). As with insulin, there was a significant reduction of glucose both when all the studies were looked at together and when considered by intervention type. A meta combination of all the study groups (fixed effects model) and aerobic interventions (random effects model) showed a significant mean decrease in glucose levels of -4.71 mg/dl (95% CI -7.4 to -2.0) and -4.69mg/dl (95% CI of -7.5 to -1.9) respectively. In spite of overall significant reductions, all the individual studies showed non-significant reductions except the study by Raz (Raz 1988) which showed a significant reduction.

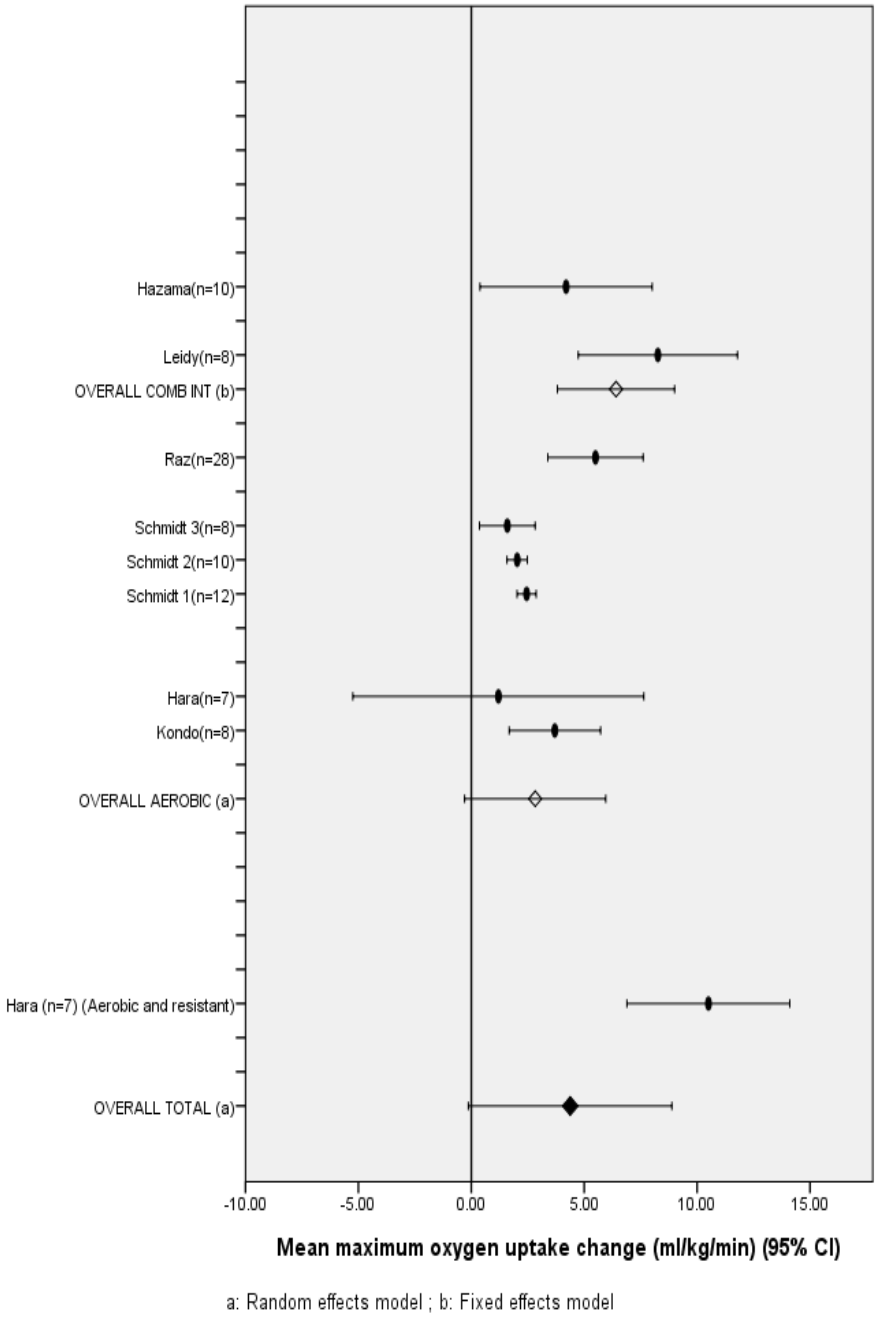
Figure 2.10 Mean glucose change by intervention



a: Random effects model ; b: Fixed effects model

2.4.3e Maximum oxygen uptake changes (Figure 2.11): Maximum oxygen uptake ($VO_{2\ max}$) is the maximum capacity of the body to transport and utilise oxygen during exercise, also called aerobic capacity. It was measured by nine study groups (six studies). A meta combination using a random effects model showed marginally insignificant increases (4.38 ml/kg/min; 95% CI -0.1 to 8.9). Assessed by intervention type, the combination interventions based on fixed effects model showed significant increases in oxygen uptake (6.41ml/kg/min; 95% CI of 3.8 to 9.0) albeit only based on two studies. Similarly, a single study of aerobic and resistance exercise intervention (Hara et al. 2005) also showed an increase of 10.5±4.87ml/kg/min. For aerobic exercise interventions, in spite of five out of six individual studies showing significant results, overall it showed a non-significant increase of 2.83ml/kg/min with 95% CI of -0.3 to 5.9 (random effects model) probably influenced by one small sample study by Hara (Hara et al. 2005) with wide confidence intervals.

Figure 2.11 Mean maximum oxygen uptake change by intervention



a: Random effects model ; b: Fixed effects model

Overall, significant improvements were observed, irrespective of the type of intervention, for HDL cholesterol, insulin and glucose. Maximum oxygen uptake showed a marginally insignificant improvement when all the interventions were considered together and with aerobic interventions. None of the behavioural interventions, and very few of the combination interventions (four study groups), assessed these outcomes. This made any comparison of different type of interventions inappropriate.

2.4.4 Effects of the interventions on psychological outcomes

In addition to the weight measure changes, the two behavioural/motivational intervention studies (Ames et al. 2005;Oka 1998) also assessed psychological measures. The study using a motivational technique as an intervention (Oka 1998) showed significant improvement in self efficacy in '*controlling dietary behaviour*' (2.00 to 4.78; $p<0.01$) based on a seven 3-point scale and self efficacy in '*performing diet'* (1.20 to 4.44; $p<0.01$) based on an eight 3-point scale. Since no other explanation of the scales was provided and no standard deviations were given in the paper (no response regarding further information from authors) no further interpretation was possible. The study by Ames (Ames et al. 2005) assessed depression, self esteem, satisfaction with body areas and appearance. Here, standard behavioural intervention seemed to significantly improve self esteem and body area satisfaction ($p<0.05$), whereas the reformulated cognitive behavioural intervention significantly improved individual's appearance score and depression ($p<0.05$) (Appendix 1.7, pg.289).

2.4.5 Association between obesity measures and the health outcomes

Meta regression (weighted by each of the health outcome) was used to assess whether changes in weight measures were associated with changes in the health outcomes. Initially, a matrix was created with the number of study groups and sample sizes for each weight measure and the health outcomes (Table 2.4) to identify the measures that had reasonable representation.

Table 2.4 Number of study groups and sample sizes for each obesity measure and health outcomes

Obesity measures						
		Body weight	***Body Mass Index (BMI)***	***Body fat mass***	***% Body fat***	***Lean body mass***
Health outcomes	***Total cholesterol***	**5 groups (4 studies)** Hara1 (n=7) Hara 2(n=7) Kondo (n=8) Eliakim(n=20) Hazama(n=10) **Total n=52**	**3 groups (2 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) **Total n=22**	**4 groups (3 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Hazama(n=10) **Total n=32**	**4 groups (3 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Hazama(n=10) **Total n=32**	**2 groups (2 studies)** Kondo(n=8) Hazama(n=10) **Total n=18**
	HDL cholesterol	**6 groups (5 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Eliakim(n=20) Raz (n=28) Hazama(n=10) **Total n=80**	**4 groups (3 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Raz(n=28) **Total n=50**	**4 groups (3 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Hazama(n=10) **Total n=32**	**4 groups (3 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Hazama(n=10) **Total n=32**	**2 groups (2 studies)** Kondo(n=8) Hazama(n=10) **Total n=18**
	Insulin	**5 groups (4 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Raz(n=28) Eyjolfson(n=10) **Total n=60**	**5 groups (4 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Raz(n=28) Eyjolfson(n=10) **Total n=60**	**3 groups (2 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) **Total n =22**	**4 groups (3 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Eyjolfson(n=10) **Total n =32**	**1 group (1 study)** Kondo(n=8) **Total n =8**
	Glucose	**5 groups (4 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Raz(n=28) Eyjolfson(n=10) **Total n =60**	**5 groups (4 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Raz(n=28) Eyjolfson(n=10) **Total n =60**	**3 groups (2 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) **Total n =22**	**4 groups (3 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Eyjolfson(n=10) **Total n =32**	**1 group (1 study)** Kondo(n=8) **Total n =8**
	Maximum oxygen uptake	**9 groups (6 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Schmidt 1(n=12) Schmidt 2(n=10) Schmidt 3(n=8) Raz(n=28) Leidy(n=8) Hazama(n=10) **Total n =98**	**8 groups (5 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Schmidt 1(n=12) Schmidt 2(n=10) Schmidt 3(n=8) Raz(n=28) Leidy(n=8) **Total n =88**	**5 groups (4 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Leidy(n=8) Hazama(n=10) **Total n =40**	**5 groups (4 studies)** Hara1(n=7) Hara 2(n=7) Kondo(n=8) Leidy(n=8) Hazama(n=10) **Total n =40**	**3 groups (3 studies)** Kondo(n=8) Leidy(n=8) Hazama(n=10) **Total n =26**

This shows that the only reliable assessment to be made, based on the number of data points and the sample sizes, was the association between the body weight changes and the five health outcomes (total cholesterol, HDL cholesterol, insulin, glucose and maximum oxygen uptake) measured. The other adiposity measures were not sufficiently represented with the health outcomes. Each of the health outcomes was weighted by the inverse of their standard error. With the health outcomes as the dependent variable and the mean difference in the body weight as the predictor (independent variable), a meta- regression was conducted.

Table 2.5 Regression analysis

		ANOVA		Coefficients		
Dependent variable	**Adjusted R Square**	**F**	**Sig.**	**β Coefficient**	**t**	**Sig**
Total Cholesterol	.202	2.014	.251	2.183	1.419	.251
HDL Cholesterol	.618	9.090	.039	-1.296	-3.015	.039
Insulin	.248	2.323	.225	-.194	-1.524	.225
Glucose	-.310	.053	.832	-.206	-.231	.832
Maximum Oxygen Uptake	-.133	.058	.816	.094	.242	.816

Independent variable (Predictor): Final mean difference in body weight before and after the intervention

The meta-regression analysis shows (Table 2.5) that the only significant model was for the change in HDL Cholesterol. Data for this was available from six study groups (five studies).The resulting model accounted for 62% of the variance in HDL cholesterol as predicted by the weight changes. The model showed that weight changes reliably predict change in HDL cholesterol levels (F 9.090 and p=0.03) whereby one kilogram decrease in body weight predicts that HDL cholesterol will increase by 1.3mg/dl.

2.5 Summary

This systematic review is the first to focus specifically on young people, a vulnerable group for weight gain, and to assess obesity interventions conducted among them. The interventions specific for weight loss showed some effects in young people; however, the varied components and duration of the interventions makes it difficult to identify the most effective intervention for weight loss in this age group. Interventions showed significant improvements in HDL cholesterol, insulin and glucose levels, with no significant improvements in some other health outcomes such as total cholesterol and oxygen uptake. Two studies looking at psychological outcomes showed significant improvement in self-esteem, self efficacy, appearance and satisfaction with body image, which are crucial factors for this age group.

The meta regression carried out between body weight and health outcomes only showed evidence of a relationship between weight loss and improvements in HDL cholesterol unlike in adult populations where weight loss benefited total cholesterol levels, reduced the risk of developing diabetes and showed evidence of some hypertension reduction in certain groups (Aucott et al. 2004;Aucott et al. 2005;Poobalan et al. 2004). The lack of improvement in this younger target group for some of the health outcomes could be due to the fact that the initial cholesterol and levels of other factors were normal at baseline among the subjects, despite being overweight, giving less scope for improvement. The interpretation of this result is also complicated by the small sample sizes and virtually no follow up after the completion of the intervention in any of the studies.

The small sample sizes of the included studies highlights a major recruitment issue in young people. Some of the studies included in this review reported that they were unable to recruit in spite of planning the study with larger numbers and also reported problems of high attrition rates (Ames et al. 2005;Eiben & Lissner 2006). Some of the studies have acknowledged the small numbers as a limitation of their study but did not give any reasons (Fernandez et al.

2004;Kondo, Kobayashi, & Murakami 2006). It is not clear from the other papers if the studies tried to recruit more and failed or if they always intended to recruit only a few. Of the 20 study groups in this review, 11 were already overweight or obese at the start of the interventions highlighting the increasing vulnerability of this age group. In spite of this, the number of young people participating in studies seems to be low and it is complicated by the fact that this is a difficult group to monitor and follow up. Consequently, studies often focus on either children or adults and ignore this young and vulnerable age group since it forms the opposite extremes of both groups.

Most of the interventions included in this review were conducted in strictly controlled environments either as part of compulsory university course giving credits for participation or as part of training programs (i.e. military training). Six of the included studies were aimed specifically at weight loss or at effects of interventions on obesity, whereas some focused on other health outcomes such as insulin/glucose levels and/or psychological outcomes and only measured weight loss as a secondary outcome. The disparate nature of interventions, participants, settings and aims of studies restricts the generalisability of the findings and highlights the paucity of data for this age group. In addition to small sample sizes, most of the interventions were short term ranging from two weeks with only one point of contact to 28 weeks. One paper reporting on a life style intervention did last for a year, which probably was only possible since it was part of the well established Swedish Obesity Study (SOS) (Eiben & Lissner 2006). Again, none of the studies had any follow-up after the completion of the intervention except for one study with 6 months follow-up (Ames et al. 2005). The short term nature of some of the interventions of only two weeks (Oka 1998) and the lack of follow-up in most studies may not have provided enough time for the real benefits of the interventions to be measured. In addition, most of the health outcomes measured in this age group, were normal to start with, hence there would be little room for improvement in the short intervention period. Long-term cohort studies with larger samples may be useful to assess such health benefits associated with weight loss/maintenance.

Within the studies included in this review, there seems to be a trend that men participate more in exercise training programmes while women undergo more diet and behavioural intervention programmes as highlighted in previous studies (Colvin & Olson 1983). This necessitates further exploration to understand the reasons for young people's participation and/or their choice of intervention in obesity prevention or treatment programmes.

This review initially set out to assess controlled trials, with an intention to compare the intervention with controls. However, a direct comparison was deemed inappropriate due to: 1. non comparable control groups at the baseline 2. few studies reporting change data and hence the need for estimation and 3. singleton interventions. Studies also had disparate study design, small sample sizes, varied duration of intervention and follow-up. Consequently, only before and after comparisons, could be conducted on 'intervention' arms, treating each active study arm as individual studies. This limits the review by not being able to account for the regression to the mean and being able to identify the most effective intervention. However, it was the best method available to pursue. There is also a small chance that studies conducted with young people were missed because they mentioned only 'subjects' and 'participants' without the specific age group.

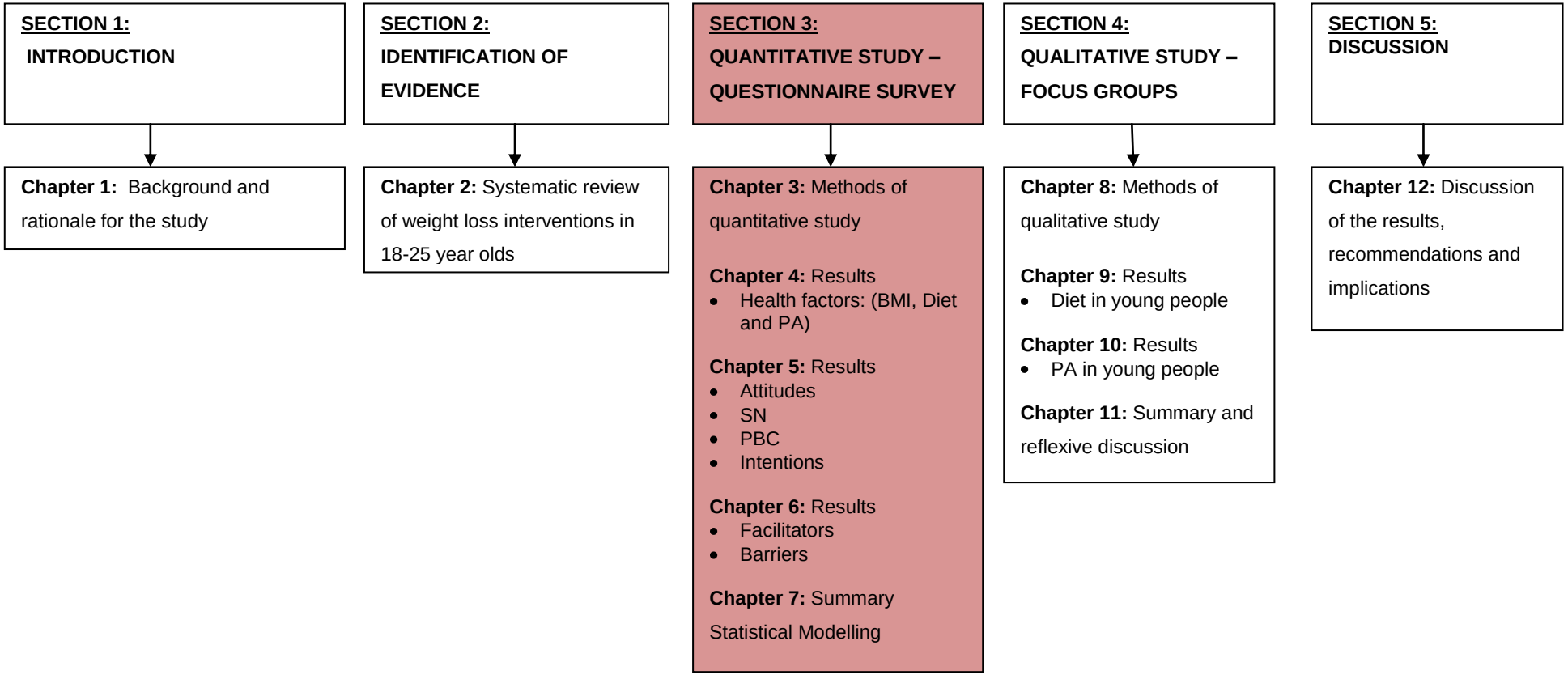
In summary, young people aged between 18-25 years are vulnerable to weight gain but only show insignificant improvements in adiposity measures and health outcomes. Combination interventions are more promising than others. The small sample sizes may highlight the reluctance of young people to participate in any kind of health intervention either due to high mobility or lack of motivation. However, the included studies suggest preferences of intervention by gender, whereby more males participate in exercise interventions and females are more inclined to participate in diet and/or behavioural interventions. Consequently, understanding their knowledge, attitudes towards leading healthy lifestyles and preferences/choice of interventions is crucial. The next section explores the lifestyles related to obesity among young people in detail. This will help to develop interventions with

components designed to motivate young people into participating in weight loss/maintenance programmes. This may in turn help them to lead healthier lifestyles with psychological benefits alongside the ultimate long term health benefits.

SECTION – 3

QUANTITATIVE STUDY – QUESTIONNAIRE SURVEY

Figure 1.1 FLOWCHART OF THE STRUCTURE OF THE THESIS
PREVENTION OF OBESITY IN YOUNG PEOPLE



Chapter 3: Methods of quantitative study

The second objective of this thesis was to first, explore the perceptions, knowledge, attitudes and behaviour of 18 -25 year olds towards obesity and healthy living and second, to identify motivational factors, barriers and facilitators with respect to prevention of weight gain and/or maintaining healthy weight in young people. The methodology for this exploration was a mixed method approach (questionnaire survey followed by focus groups). This section (Section 3) will address the quantitative study, with this chapter covering the methods of the questionnaire survey.

The systematic review of weight loss interventions in young people presented in the previous chapter identified possible effective interventions in this age group. However, it also highlighted some of the issues around these interventions. Interventions in this age group were short term, conducted in specific groups of people (university students, military recruits) in controlled environments. Low levels of recruitment were highlighted and gender preferences were observed. These issues make it difficult to generalise the results to all in this age group living in the community. Consequently, it is important to understand young people's attitudes and perceptions about healthy life style in addition to their level of knowledge. It is also crucial to identify the barriers and facilitators/motivators towards leading a healthy lifestyle, particularly if they had made an attempt to change their lifestyle. Literature suggests that 'behavioural theories' provide useful frameworks and variables to understand behaviours of people (Baranowski T 2006).

The objectives of this section are to:

1. Explore theories that explain health behaviour and health behaviour changes
2. Review the behavioural theories commonly used with young people and/or in the area of obesity
3. Develop a questionnaire to explore the lifestyle of young people (18 -25 year olds) based on the appropriate behavioural theory identified
4. Identify a representative sample of 18 -25 year olds
5. Conduct a questionnaire survey
6. Analyse the resulting data

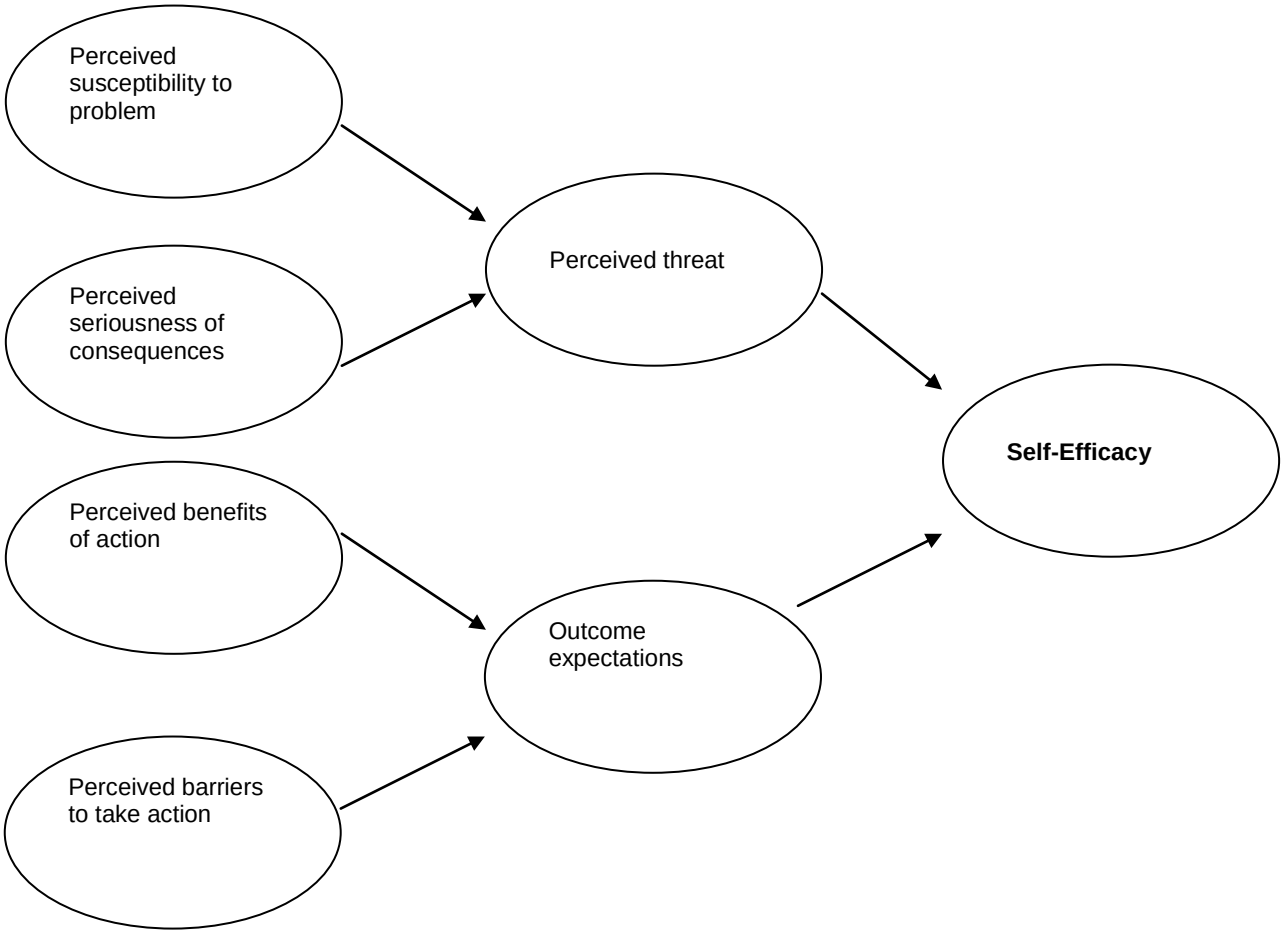
3.1 Exploration of theories of health behaviour

Theory is *"Systematically organised knowledge applicable in a relatively wide variety of circumstances devised to analyse, predict, or otherwise explain the nature or behaviour of a specified set of phenomena that could be used as the basis for action"* (Van Ryn M & Heany CA 1992). The characteristics of a fully developed theory is that (a) it would explain the major factors that influence the phenomena of interest (b) explain the relationship between these factors and (c) explain the conditions under which these relationships do or do not occur (Nutbeam D & Harris E 1999). Various health promotion theories have been developed and expanded over the past two decades, drawing from various disciplines such as psychology, sociology, marketing and management. Some of the most commonly used health behaviour theories focusing on individual characteristics are discussed below.

3.1.1 Health Belief Model

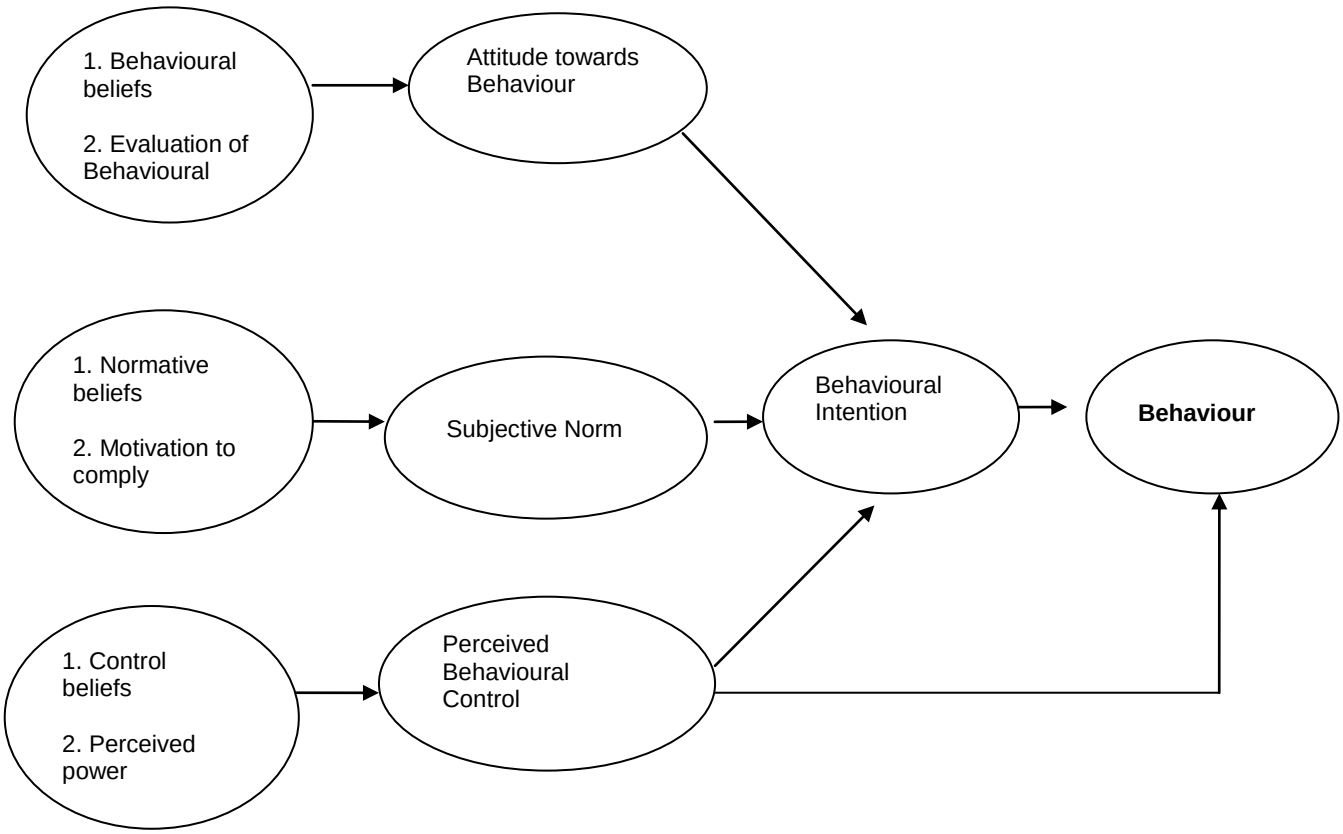
This model was designed and developed by Rosenstock and Becker to explain health behaviour by better understanding of beliefs about health. This model suggests that an individual's reaction to a health problem is based on the interaction between four different types of belief (Figure 3.1). This model predicts that an individual will take action if they perceive themselves to have a threat by either being very susceptible to a condition or if they believe that it will have potentially serious consequences. It is weighed against the perceived benefits that they would get from specified action and the barriers to taking action (outcome expectations). Consequently, this is believed to give the individual the perceived ability to carry out a recommended action (Self-Efficacy) and change their behaviour.

Figure 3.1 Health Belief Model (Nutbeam D & Harris E 1999)



3.1.2 Theory of Reasoned Action and Planned Behaviour

Figure 3.2 Theory of reasoned action and planned behaviour (Nutbeam D & Harris E 1999)



The Theory of Reasoned Action was developed by Ajzen and Fishbein in 1980.

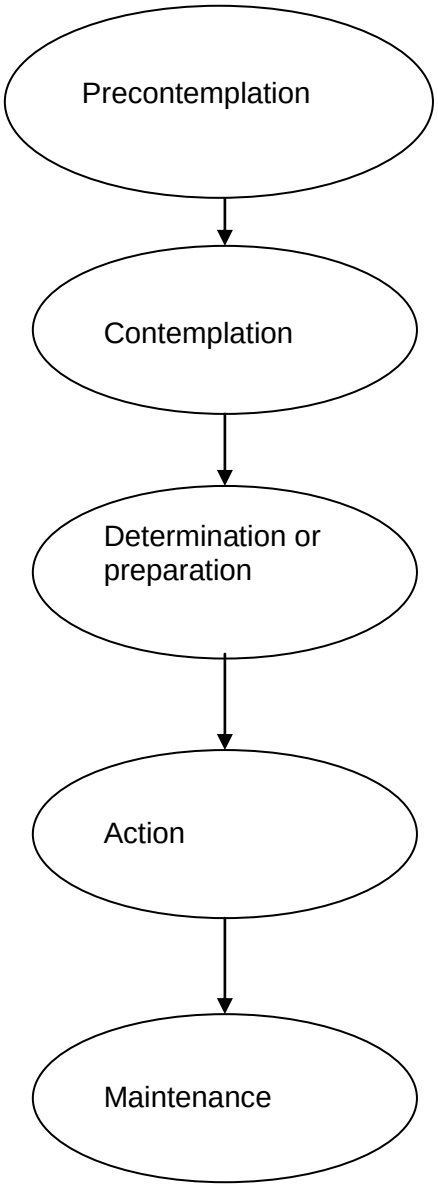
The theory states that an individual's behaviour is informed by their intentions. Behavioural intention is in turn influenced by attitudes towards behaviours, subjective norms and perceived behaviour control (Figure 3.2). Attitudes are determined by the belief that a desired outcome will occur if particular behaviour is followed and the outcome will be beneficial to health (Nutbeam D & Harris E 1999). Subjective norms relates to a person's belief about what is expected of him/her (normative belief) and the person's motivation to comply to the other people's wishes. Perceived Behavioural control is a personal control over behaviour. This theory overall, predicts that a person is most likely to adopt and change the

behaviour if that person believes that it will be beneficial to their health and is socially desirable.

3.1.3 The Transtheoretical (Stages of change) model

This model was developed by Prochaska and DiClamente. It describes and explains different stages of change that seem to happen in any behavioural change process. The basic stages of change are shown in Figure 3.3 below

Figure 3.3 The Transtheoretical (Stages of change) model



This model considers that behavioural change is a process and not an event because individuals have varying levels of motivations at different points of time. It also acknowledges that it is a circular model rather than linear, where people can enter and exit at any time although people appear to move in a predictable way through the stages. There is also a possibility that some move more quickly than the others and some cannot move any further after a particular stage, depending on their motivation and barriers they encounter.

Precontemplation is a stage in which individuals do not even consider changing behaviour or do not want to change. Then comes the contemplating stage where the person considers making a change to a particular behaviour. This leads to preparing for that change and being determined to achieve that change which finally initiates the change. The maintenance stage is when they make efforts to maintain that change and achieve the predictable gains. From here they may succeed in maintaining the gains effectively or they may relapse and have to start all over again. This theory helps health personnel to support individuals through the stages, by acknowledging that they might drop out at any time or consider trying again.

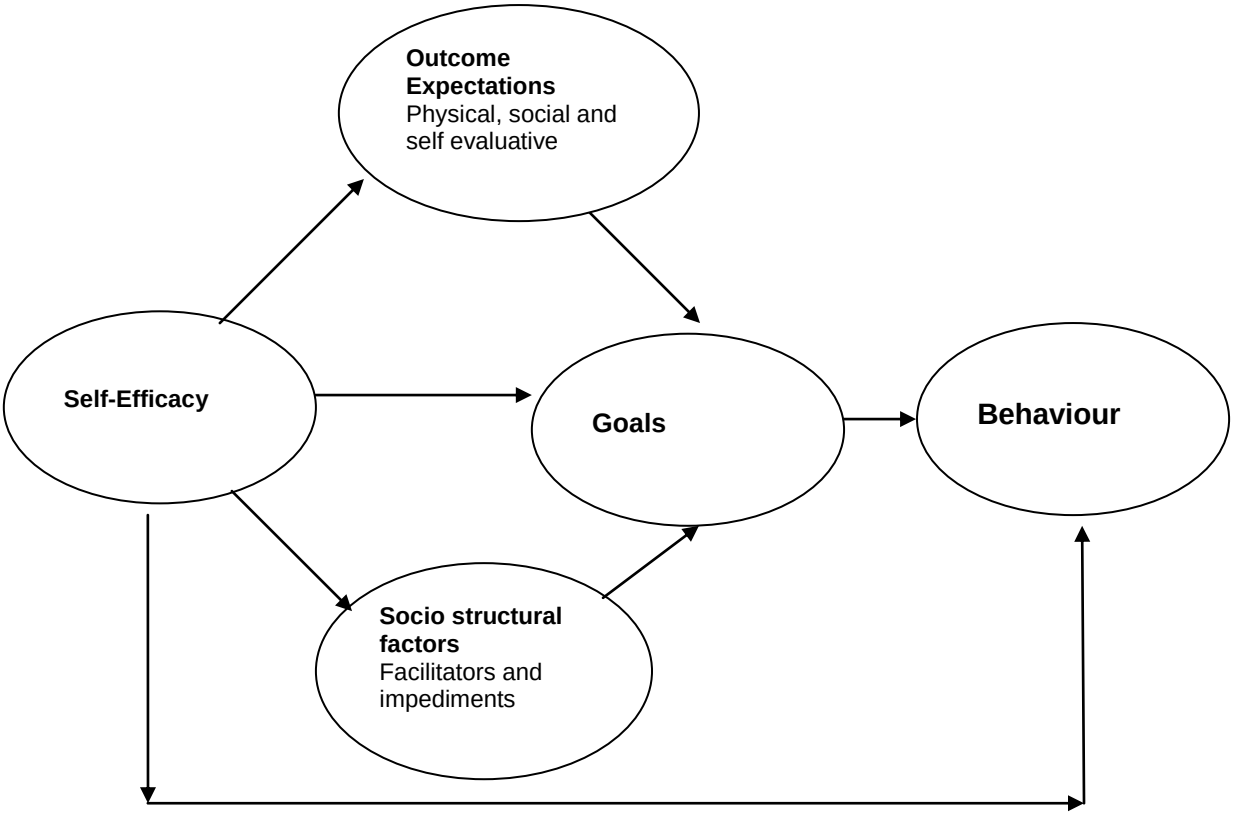
3.1.4 Social Learning Theory (SLT) or Social Cognitive Theory (SCT)

Concepts of Social Learning Theory started in the 1940s and evolved over the next 60 years with input from several researchers, but was significantly shaped by the influential contribution of Albert Bandura's work in the 1970s. This theory builds on the understanding that there is a constant interaction between an individual's behaviour and their environment. The third component of this interaction is the individual's cognitive factors which affects and is affected by the other two factors (behaviour and environment). This three way interaction is subtle and complex and as a principle is referred to as reciprocal determinism (Nutbeam D & Harris E 1999). There is a constant interacting and influencing between characteristics of a person, behaviour of that person and the environment in which behaviour occurs, with changes in one component significantly influencing the other components.

The major concepts of the Social Cognitive Theory are observational learning (*behaviour that occurs by watching the action and the rewards of other's behaviour)*, expectations *(anticipatory outcomes of a behaviour)*, expectancies (*values that a person places on a specific outcome*), behavioural capabilities (*knowledge and skill to perform a given behaviour*), self-control (*personal regulation of goal – directed behaviour or performance*), self- efficacy *(person's confidence in performing a given behaviour)* in addition to the environment *(factors physically external to the person)* and situation *(person's perception of the environment)* (Baranowski T, Perry CL, & Parcel GS 1997).

Self-efficacy is proposed as the most important construct of behavioural change in SCT, while taking other constructs into consideration (Bandura A 2004). Bandura in 2004 defined a structural pathway of influence where, perceived self-efficacy affects health behaviour either directly through goals or through outcome expectations (physical, social or self-evaluative) and perception of sociostructural factors (barriers and facilitators). Goals can be proximal (immediate) or distal (long-term). SCT takes both the underlying determinants of health behaviour and methods of promoting change into consideration and is widely considered as the most complete theory currently applied to health promotion (Nutbeam D & Harris E 1999). This model is shown in Figure 3.4.

Figure 3.4 Self-Efficacy and its influence on behaviour (Bandura A 2004)



3.1.5 Limitations and overlap of health behaviour theories

Although each of these theories has specific focus and purpose, there are some limitations based on the assumptions within each of the theories. In the Health Belief Model (Figure 3.1), there is an assumption that individuals will think rationally, be able to weigh up their risks and consequences of disease, perceive the benefits of action and feel capable of taking it. This model is likely to work in conditions where there is an immediate threat or negative consequence (i.e. meningitis) and in one time simple behaviours like accepting a screening test. This is unlikely to be effective in long-term, more complex socially determined behaviours as there are variations among individuals and their health behaviour depending on their attitudes and beliefs (Strecher VJ & Rosenstock IM 1997).

The Theory of Reasoned Action and Planned Behaviour takes individual variance into consideration (Figure 3.2) but assumes that intention to act is the most immediate determinant of behaviour and that all other factors influencing behaviour will be mediated through behavioural intention (Naidoo J & Wills J 2000). However, recent studies that looked at TPB constructs to predict intention and behaviour (Armitage & Conner 2001;Gardner RE & Hausenblas HA 2005) showed that all the construct measures predict intentions but none of it predicted exercise and diet behaviour. The developers of TPB have acknowledged that there could be many factors/situations (e.g. death in the family, an accident, access to health care, costs etc.) beyond the immediate control of individuals which may influence their ability to behave in a desired way.

The Transtheoritical Model (Figure 3.3) helps in tailoring interventions for different people with different needs and in different circumstances (as different people will be at different stages in the model) rather than assuming one intervention will be applicable to all. This model is individual based and might be useful in closely monitored clinical settings. However, this theory might not be useful in considering interventions for bigger groups and diverse populations.

Social Cognitive Theory explains human behaviour in terms of the interaction between a person's behaviour, personal factors and the environmental influences. However, it has been criticised for not completely capturing the non-linear relationships that might exist between the constructs and in not providing clear guidance when anticipating such non-linear relationships (Baranowski T, Perry CL, & Parcel GS 1997).

Behavioural theories are developed from time to time, either by creating new ones or sometimes by refining/modifying existing theories. Many of these theories contain constructs which measure the same property but use different names (Noar SM & Zimmerman RS 2005;Weinstein 1993). A review of such constructs across five different health behaviour

theories identified similar elements within these health behaviour theories (Noar SM & Zimmerman RS 2005). For example, the construct of 'perceived behaviour control' in TPB is similar to 'self-efficacy' in SCT and similarly the construct of 'behavioural intention' in TPB is identical to 'self-control/self regulation' from the SCT. These sets of similar theoretical constructs are called the 'domains' (Michie S et al. 2005). In addition to the overlap of terminologies/concepts between theories, it is also important to acknowledge that, as research progressed in the area of psychosocial models for behaviour change, these theories have evolved with various modifications over time. Consequently there is a possibility that there are other constructs that might be crucial to behaviour change that have not been identified /researched until now and have not been added on to the existing theories. Hence, the constructs and the pathways in the existing psychosocial models are by no means complete in influencing behaviour changes. However, it is useful to identify an appropriate psychosocial model of behaviour change as a framework to explore/understand behaviour.

3.1.6 Review of health behaviour theories used in young people and/or in obesity

Given that there are four commonly used health behaviour theories with several constructs that overlap between them, a literature search was conducted in an attempt to identify the most appropriate health behaviour theory for use either in terms of obesity and/or in bringing about behaviour change in young people. This literature search was conducted in Medline from 1996 -2009 using mesh or key terms such as 'psychological theory', 'health behaviour theory', 'young people', 'youth' and 'obesity' (Appendix 2.1, pg.292). The search identified 282 studies using health behaviour theories to research young people and/or obesity including lifestyle factors such as diet and physical activity.

These were refined down to just 21 studies, identified in modelling their intervention in young people using one of the health behaviour theories. The details of the studies and theories used are given in the table below (Table 3.1).

Table 3.1 Health Behaviour theories used in interventions for young people

	Topic area	Age	Theory used
1	Skin cancer	12-20 years	Theory of Planned Behaviour
2	HIV/AIDS	Young people	Social Cognitive Theory
3	Binge drinking	Young people	Theory of Planned Behaviour
4	Organ donation	Young adults	Theory of Planned Behaviour
5	HIV/AIDS		Social Cognitive Theory
6	Walking	Young adults	Theory of Planned Behaviour
7	Rule following behaviour in shelters	Young people	TPB and SCT
8	Diabetes	Young people	Health Belief Model
9	Physical activity	No age given	Social Cognitive Theory
10	Smoking	13-19 years	Theory of Planned Behaviour
11	Sexual health	Older adolescents	Theory of Planned Behaviour
12	Smoking	Older adolescents	TPB, SCT Social Attainment Theory and Problem Behaviour Theory
13	Ecstasy use	Young adults	Theory of Planned Behaviour
14	Diabetes prevention	Youth	TPB,HBM,SCT and Ecological model
15	Contraceptive pill use	Young adults	Social Cognitive Theory
16	Physical activity	17-24 years	SCT and Stages of Change Model
17	Smoking	Young adults	Transtheoretical Model
18	Smoking	Young people	HBM and Theory of Reasoned Action
19	Physical activity intention	Young adults	Theory of Planned Behaviour
20	Nutrition behaviour	Wide age range	Social Cognitive Theory
21	Exercise intention	Obese individuals	Theory of Planned Behaviour

SCT: Social Cognitive Theory; TPB: Theory of Planned Behaviour; HBM: Health Belief Model

Of the 21 studies conducted in young people, 19 used either the Theory of Planned Behaviour (TPB) or Social Cognitive Theory (SCT) on its own or in combination with other theories. Studies that have focused on either physical activity or diet tended to use TPB or the SCT.

3.1.7 Selection of best theoretical framework by comparing and contrasting the theories of health behaviour for healthy life style and obesity prevention in young adults

Considering the strengths and limitations of the most commonly used health behaviour theories and identifying those commonly used in young adults and/or obesity, Social Cognitive Theory (SCT) was deemed the most appropriate theoretical basis for the questionnaire. SCT explains behaviour by offering predictors and also gives principles on how to inform, enable, guide and motivate people to change behaviour (Bandura A 2004). Change in levels of obesity by making significant changes in lifestyle, not only depends on the behaviour of an individual but also on other forces including social, economic and environmental conditions that significantly influence the behaviour of an individual. SCT incorporates these external factors as constructs which are not addressed in the other commonly used theories (Health Belief Model, Theory of Planned Behaviour and Transtheoritical model). In addition, SCT is considered the most complete theory currently applied to health promotion and is recognised as a bridge between the theories that focus on individual behaviour and theories that explain the change in communities and communal action for health (Nutbeam D & Harris E 1999). However, the constructs of Theory of Planned Behaviour are also well researched in the area of physical activity and commonly used in young people. There is a recognition in the literature that for some behaviours, a single theory might not be appropriate but that a theoretical integration approach is a way forward (McLeroy KR et al. 1993;Noar SM & Zimmerman RS 2005). Experts believe that there could be benefits in drawing on more than one theory to respond to a problem in order to achieve the goals (Nutbeam D & Harris E 1999). While the Theory of Planned Behaviour is useful to identify the key factors that influence health behaviour, it focuses only on behaviour in isolation not taking the social and environmental influences into consideration. Social Cognitive Theory, however, allows for subtle interactions between behaviour and the environment and cognitive factors and these, in turn, may influence behaviour. In addition,

Self efficacy in the SCT, a concept closely allied to perceived behaviour control from the TPB, allows for influence by factors beyond the individual's behaviour. Considering the strengths of the theories and the literature conducted among young people in areas of diet and physical activity, both constructs from both TPB and SCT were used in conjunction to underpin the diet and physical activity sections of the questionnaire.

3.2 Development of the questionnaire

3.2.1 Original survey

The NHS Grampian had conducted lifestyle surveys roughly every three years in the Grampian area since 1992. The aim of these surveys is to assess trends in health related lifestyle among people in Grampian which enable the Health Board to monitor the impact of health programmes and also to plan for future health improvement. These were conducted in two different target populations: among secondary school pupils (youth lifestyle survey) and among adults in the community (adult lifestyle survey). The youth survey was conducted on a 10% sample of all 1st to 6th year secondary school pupils in Grampian and the adult lifestyle surveys used a 2% stratified random sample of the Grampian population aged between 16 and 74. The questionnaires were self-completed and included 10 sub sections on general health, food, physical activity, smoking, alcohol, drugs, wellbeing, oral and dental health, accidents and sexual health and relationships (Appendix 2.2, pg. 293). The lifestyle survey questionnaires over the years were similar, keeping with the aim of these surveys. After a six year gap, NHS Grampian intended to repeat the survey in 2007 in collaboration with the University of Aberdeen.

3.2.2 Limitations of the original survey

3.2.2a Target population: The adult survey was conducted among a 2% stratified random sample of the Grampian population aged between 16 and 74. The response rate for the adults survey over the years was usually low (48% in 1998 and 53% in 2002), in spite of sending a second survey to the non-responders. Young adults between the ages of 18 and 25 year were identified by the WHO as one of the six 'high risk' populations to gain weight (WHO Consultation 2000). However, only 13% of 18-25 year olds participated in the adult survey in 1998 and 2001. These low response rates of adults with the wide age range made interpretation of the results less useful. Most 18 to 25 year olds are at a transitory period when they move on from being under the protection and/or influence of their families, develop and establish behavioural patterns to lead independent lives and become responsible for younger children. Moreover, between the years 1991 and 2001, the greatest increase in obesity (BMI >30) was found among 18-29 year olds (7.1% to 14%) with more recent reports in 2005 confirming this trend (Stamatakis E 2005). In spite of the evidence that 18-25 year olds are a vulnerable group for weight gain, little attention is paid in research to capture this group.

3.2.2b Content of the questionnaire: The original questionnaire had 10 sub sections intended to measure the trends and changes in lifestyle and behaviour over time. Repeating the survey at regular intervals over a 10 year period, allowed comparison with previous surveys to note the changes. For example, 25% of young people ate chips three or four times every week in 1998 which increased to 37% in 2001. In comparison, in spite of national dietary target for 75% of young people to eat fish twice a week, the number of people eating fish did not increase over the years (16% in 1995, 18% in 1998 and 19% in 2001). For physical activity, pupils from 1st to the 4th year exercised regularly whereas the physical activity levels dropped in the 5th and 6th year pupils with gender differences. Although the original questionnaire captured these changes over time, it did not explore why these changes were emerging. A detailed look at the questionnaire also showed that although

some of the questions were repeated in the survey over the years, many were never analysed and/or used in the report (Appendix 2.2 with unused questions highlighted, pg 304).

3.2.2c Lack of theoretical underpinning of the questionnaire: There was no evidence that the original questionnaire was based on any particular behavioural theory. Health promotion surveys/interventions are usually criticised for not being grounded in a theory. They are criticised for having a limited theoretical basis by relying on assumptions and/or implicit theories based on available literature or personal experiences. These assumptions may underestimate or ignore factors that could be associated with a particular situation. However, the use of theories helps identify determinants or associated factors of a particular problem, helps to understand the nature of the problem and the target population. By identifying and/or predicting issues and explaining behaviour, it helps to design/implement programmes that are more likely to be successful in achieving behavioural change(Glanz K, Lewis FM, & Rimer BK 1997;Noar SM & Zimmerman RS 2005).

3.2.3 Changes to the questionnaire and the survey for the PhD

In acknowledgment of the above limitations of the original survey and after exploring the theoretical approaches, the following changes were made to the survey used in this thesis.
1. Given that young adults are identified as one of the vulnerable and difficult to reach group and the poor response rates of previous adult surveys, 18-25 year olds were targeted as part of this study instead of the wider age range (16-74 year olds). The youth survey among the secondary school pupils was conducted again with a suitably adapted questionnaire but is not the remit of this thesis. Both the surveys were approved by the Director of NHS Grampian and the lifestyle survey steering group. The steering group consisted of Community Health Partnership (CHP) leads for Public Health, Physical activity and Nutrition for NHS Grampian, experts in Public Health, Health Promotion and Sociology, representatives from University of Aberdeen, Robert Gordon University and Aberdeen College, and a Medical Statistician.

2. In keeping with the aims of the original survey, the core questions were retained to monitor the trends of behaviour and to maintain consistency. Questions that had not been analysed or used in the previous reports were discussed and removed, or replaced with questions that would not only assess the knowledge but also attitudes and intentions towards healthy life style. Questions addressing the facilitators and barriers to healthy lifestyle were retained.
3. The new questions included were grounded in the theories of behavioural change after selecting the appropriate theoretical framework for healthy life style and obesity prevention in young adults. This being a combination of Theory of planned behaviour and Social cognitive theory as explained earlier.

3.2.3a New Questions: New questions were included in various sections of the questionnaire as described below:

Demographics: The demographics section of the original questionnaire (Appendix 2.2, pg 293) used in 2001 was modified for the 18-25 year olds. It now contains questions on age, sex, ethnicity, time resident in the UK and Grampian, their status (e.g. in education, in employment or training, unemployed etc), details of education if they were students, their living arrangements, postcode and their self reported height and weight (Appendix 2.3, pg. 330).

Diet and physical activity: The National guidelines for eating '5 a day' and physical activity was specified in the amended sections of the questionnaire. Questions that were not analysed and/or reported in the previous surveys, those that did not add constructively to the existing information were removed from the original questionnaire after consulting the steering group. For example, in the diet section, the food frequency type of questions which asked about types of bread or type of milk were removed (Appendix 2.2, pg.304; q30 and 32) Similarly, in the physical activity section, questions asking about the type of activities outside school and those that were repeating itself (Appendix 2.2, pg.308; q42-44) were removed. The relevant questions remaining were scrutinised to ensure that they would provide pertinent information. In addition, validated questions addressing the important constructs

from the TPB (attitude, behavioural intention, behaviour) and SCT (barriers and facilitators) were compiled as part of this thesis (Appendix 2.3, pg.330). The final questionnaire and the respective section were discussed with the steering group and were approved by the group.

Consequently, for the 'Food' section, two validated questions based on Theory of Planned Behaviour were added, one question each to assess attitude (Q 36; Appendix 2.3, pg.339) and behavioural intention (Q 37; Appendix 2.3, pg.339). These two questions had been validated among Portugese children (Araújo-Soares 2006) but were translated and approved by the authors before being used in English language. Two questions on fruit and vegetable eating behaviour based on national guidelines (Q 26 and 27) and seven questions (Q27 to 35) to assess the daily eating pattern including snacking were included. Three questions (Q 38-40; Appendix 2.3, pg.339) were included to assess the barriers and facilitators for healthy eating (Ball K & Crawford D 2006).

For the physical activity section, one validated question each (Araújo-Soares 2006) was added to assess attitude, perceived behavioural control and behavioural intention based on the Theory of Planned Behaviour (Q 42, 43 and 44; Appendix 2.3, pg.340). Three questions on active (Q41, Appendix 2.3, pg 340) and sedentary behaviour (Q45 and 46, Appendix 2.3, pg 341) were added which were modified from the original questionnaire. The questions on barriers and facilitators for physical activity (Q47-49; Appendix 2.3, pg 341-42) from the original questionnaire were retained but were modified in light of the findings from the literature (Ball K & Crawford D 2006;Gardner RE & Hausenblas HA 2005) and the systematic review (Poobalan et al. 2010b). For example, the review highlighted gender differences in choosing the type of activity for weight control and hence Q 49 was added to assess preferences. The final modified questionnaire is available in Appendix 2.3, pg 330.

3.3 Sample and methods of the questionnaire survey

3.3.1 Identifying a representative sample of 18-25 year olds

3.3.1a Target sample: In spite of being in a key formative period in terms of establishing lifestyle patterns and being vulnerable to weight gain, little is known about this specific group. This is mainly because young adults between the ages of 18 - 25 are a highly mobile population (Henderson et al. 2010) and for various reasons (being a student, unemployed, males, low socioeconomic status) are unlikely to participate in health surveys (Eagan et al. 2002;Henderson et al. 2010). This thesis explored the ways of identifying and including a representative sample of young adults for this survey. According to the 2001 Census, the number of 18 -25 year olds resident in Aberdeen and Aberdeenshire was 47226 (National Statistics 2003;Registrar General for Scotland 2001). A 10% sample of young adults was initially targeted to correspond to the youth lifestyle survey in secondary schools. Young adults are likely to be either in education, employment, and training or in none of these categories. To capture those in higher education, the University of Aberdeen and the Robert Gordon University in the Grampian region were approached. For those in further education, Aberdeen College, Banff and Buchan College and Moray College were contacted. A request letter from the Director of Public Health in NHS Grampian was sent to these establishments for their co-operation. To include those who were either in employment or training, all the large employers (NHS, Aberdeen City Council, the major supermarkets such as ASDA, Tesco, Sainsbury, and Major oil companies) were approached for permission to conduct the survey. It was noted that some young people would be in training and also attending the colleges/universities as part of their training and hence already captured. Through the steering group, it was identified that within the Grampian region, young people who were Not in Education, Employment or Training were registered as NEET groups. The contact persons for the NEET groups in Aberdeen and Aberdeenshire were also approached to include those who were not in the education, employment and training categories.

3.3.1b Barriers to recruitment and solutions: There was a positive response from the further and higher education establishments. Unfortunately, there was a negative response from the major employers. They were unwilling to provide either addresses or to spend time forwarding the survey to their employees due to data protection and lack of time. Also, despite the existing NEET groups, it was hard to reach the young people within those groups as they often did not turn up for the scheduled meetings. Consequently, in order to get a representative sample of young people who might not be in higher or further education, it was decided that a 2% sample of 18-25 year olds in the community would be targeted using the Community Health Index (CHI). The Community Health Index (CHI) is a computer based population index used by NHS Scotland as a unique patient identifier. Anyone registered with a general practitioner in Scotland will have a CHI number. This 2% corresponds to the sample size that was targeted in the Grampian adult surveys in the past. This gave a sample size of 1800 from the community. Approval to conduct the lifestyle survey and access to CHI was approved by the NHS Grampian, director of Public Health as Caldicott Guardian.

3.3.2 Methods of the questionnaire survey

The modified questionnaire was sent to all those in the steering group and subject experts for comments and approval. Once approved, the questionnaire was also converted into an automatic electronic on-line survey format. For those in further and higher education, an invitation letter (Appendix 2.4, pg 362.) was compiled and e-mailed to all the students via the University and College administration. All those between the ages of 18-25 were invited to take part in an online questionnaire survey using the link provided. A hard copy of the questionnaire with a cover letter and a pre-paid return envelope was sent to 1800 of the 18-25 year olds within Grampian communities identified through the CHI. Acknowledging the overlap of the University/college and community sample, the covering letter of the questionnaire survey emphasised that they should not complete the questionnaire again if they had already completed the on-line version through the University or the colleges. Both the online and the paper questionnaire survey were conducted between December 2007 and February 2008.

3.4 Demographics and method of survey analysis

3.4.1 Response rate

From those that were sent out electronically, there were 1067 completed questionnaires received. Another 1026 questionnaires were partially completed online as some of the students experienced problems when attempting to access their partially completed online questionnaires and left them incomplete. Consequently, it was decided that a questionnaire would be considered for analysis only if at least 50% of it was completed which gave only an additional 43 questionnaires. A further 284 completed questionnaires were returned from the CHI sample. From the responses, the number of questionnaires eligible for analysis was 1394 (1067+ 43+ 284) which is around 3% of the population in this age group in Grampian. Although this is a small percentage, this is a group that has never been studied exclusively, in spite of being identified as one of the vulnerable age groups for weight gain. The sample size is also statistically credible in order to understand this 'hard to reach' age group. Only 18-25 years olds were invited to participate in the survey; however, there were some questionnaires completed by 16 and 17 year olds (n=81) which were excluded, giving a final sample of 1313 for analysis.

3.4.2 Demographics of the participants

1313 young people participated in the survey and the demographic details of the participants are described in Table 3.2. Of those who participated, 26.9% of them were males with 70.8% being females. There were 35.9% who were 18-19 years old, 45.1% between 20- 22 years and 19% were more than 23 years old. This is comparable to most of them either doing foundation (46.5%) or undergraduate courses (31.9%) and only 8.8% doing postgraduate courses which suggests that level of education might reflect age. The majority had lived in the Grampian area for more than 4 years (56%) although 18.2% had lived in the area for less than a year. Most were students (65.2%) with some studying but also employed (18.1%). Altogether 12.5% of the young people were working either full-time or part-time. Of the students who participated in the survey, 34.5% of them were doing a science degree

followed by arts students (21.6%) and those studying a health related subject (13.3%). Most of the young people (85%) lived with others with only 14.5% living alone all of the time or during the week days. The majority of young people were non smokers (73%); however, 15% smoked more than 5 a day. More than 30% drank medium to high levels of alcohol per week.

Table 3.2 Demographic details of the 1313 respondents

Demographics	Frequency	Percentages
Gender		
Male	353	26.9%
Female	929	70.8%
Missing	31	2.4%
Age		
18-19 yrs	471	35.9%
20-22 yrs	592	45.1%
23+	250	19.0%
Employment and study status		
Student	856	65.2%
Employed	164	12.5%
Student and Employed	238	18.1%
Others*	54	4.1%
Missing	1	0.1%
Subject of study (if student)		
Arts	284	21.6%
Health	174	13.3%
Science	453	34.5%
Others	184	14.0%
Missing (probably not students)	218	16.6%
Year of study		
Foundation (including HND/HNC)	610	46.5%
Undergraduate	419	31.9%
Postgraduate	116	8.8%
Missing (probably not students)	168	12.8%
Time spent in Aberdeen		
Less than a year	239	18.2%
1 to 3 years	335	25.5%
4 years or more	735	56.0%
Missing	4	0.3%
Living arrangements		
Living alone all of the time	145	11.0%
Living alone Mon-Fri	46	3.5%
Living with others	1115	84.9%
Missing	7	0.5%
Smoking		
Non Smoker	960	73.1%
Less than or equal to 5 a day	149	11.3%
More than 5 a day	200	15.2%
Missing	4	0.3%
Alcohol consumption		
Low	872	66.4%
Medium	125	9.5%
High	284	21.6%
Missing	32	2.4%

HND: Higher National Diploma; HNC: Higher National Certificate; * Unemployed, Long-term sick and others

3.4.3 Data analysis

All the data was entered into SPSS 17. The data was cleaned and double checked.

3.4.3a Research questions: The research questions for data analysis were

1. What is the prevalence of overweight and obesity among the 18-25 year olds according to WHO guidelines?
2. What is the self reported general health of 18 -25 year olds?
3. How does the diet behaviour among the 18-25 year olds compare to the National guidelines?
4. How does the physical activity behaviour among the 18-25 year olds compare to the National guidelines?
5. What are the intentions and attitudes of young people towards healthy lifestyle?
6. What are the barriers and facilitators for healthy diet and physical activity behaviour?
7. What is the association between BMI and 1.Socio demographic factors 2. Life style factors (diet, physical activity, smoking and alcohol) 3. Attitudes/ intention towards healthy lifestyle and 4. Barriers/facilitators to healthy lifestyle?
8. What is the association between Diet behaviour and 1.Socio demographic factors 2. Life style factors such as smoking and alcohol 3. Attitudes/ intention towards healthy diet and 4. Barriers/facilitators to healthy diet behaviour?
9. What is the association between physical activity behaviour and 1.Socio demographic factors 2. Life style factors such as smoking and alcohol 3. Attitudes/ intention towards physical activity and 4. Barriers/facilitators to physical activity behaviour?
10. What is the association between general health and 1.Socio demographic factors 2. Life style factors such as smoking and alcohol 3. Diet and physical activity behaviour and 4. Attitudes/intentions towards healthy diet.

3.4.3b Framework for questionnaire data analysis: A framework was developed prior to analysis of the data (Appendix 2.5, pg.363). Firstly, the health outcomes, demographic factors and lifestyle factors related to obesity within the questionnaire were identified. Health outcomes relevant to obesity were body mass index (BMI), diet, physical activity and general health (Swinburn B, Gill T, & Kumanyika S 2005;WHO 2003). BMI is a measure of obesity and perception of the general health by young people is an indication of their well being. Diet and physical activity are important indicators of energy balance. In addition, the theoretical

basis to explore diet and physical activity further was researched and relevant questions were added to the questionnaire.

A previous study which used TPB constructs exclusively as a framework for prediction of exercise and diet behaviour (Gardner RE & Hausenblas HA 2005) suggested that demographic variables might moderate the relationship between the TPB constructs and behaviour. Therefore, socio demographic factors relevant to this analysis were gender, age, level of education, area of education (science/art etc), study/employment status, living arrangement. These have all been identified to have an association with levels of obesity (Gardner RE & Hausenblas HA 2005). Alcohol and smoking could be considered both as behaviour outcomes (high calorie intake with alcohol) or as lifestyle factors related to obesity. Since the theoretical basis for smoking and alcohol behaviour were not explored and no validated questions based on theory were incorporated into the questionnaire, for this study, these were considered as risk factors rather than outcomes.

Secondly, the frequencies of the identified health outcomes (BMI based on self reported height and weight, diet and physical activity behaviour according to national guidelines and self reported general health) were determined. Then a univariate association between each of the health outcomes with all the socio demographic and lifestyle factors was assessed. Relationships between the health outcomes were also assessed (e.g. BMI and diet).

Thirdly, the attitudes, intentions and perceived behavioural control of young people towards the diet and physical activity behaviour were summarised and the associations between these and all the socio demographic and lifestyle factors were assessed.

Finally, the barriers and facilitators for the diet and physical activity behaviour were summarised and associations with demographic factors were assessed. The results are presented in the following three chapters (health factors, chapter 4; attitudes/intentions, chapter 5; and barriers/facilitators, chapter 6).

3.4.3c Recoding and regrouping of the questions: The variables in the original survey data initially were grouped in a different format to suit the aims of the Health Board. To

answer the research questions for this thesis, the relevant variables were recoded and regrouped as necessary for analysis. The details of the recoding/regrouping and the justification for regrouping are presented in Appendix 2.6, pg 366. However, relevant regroupings are highlighted in the corresponding chapters.

Chapter 4: Results - Health factors among young people

This chapter will address the frequencies of four health factors (BMI, diet, physical activity and general health) in 18-25 year olds, assess their associations with demographic and lifestyle factors as well as their relationship with other health factors. The WHO classification (WHO 2011b) was followed for assessing the prevalence of obesity. For diet and physical activity behaviour, the relevant questions assessing these behaviours were identified from the original sections of the questionnaire. When needed, these were regrouped /recoded to assess the respective behaviour. These are presented below.

4.1 Recoding/regrouping of questions on health behaviour

4.1.1 Diet behaviour

Six questions (questions 26a, 26b, 27, 29, 31 and 35) from the questionnaire were deemed relevant for assessing diet behaviour of young people.

4.1.1a Fruit and vegetable consumption (Questions 26a and 26b): Fruit and vegetable eating behaviour was addressed in questions 26a and b (Appendix 2.3, pg 336.). The 'Five a day' national guidelines recommends that five **portions** of fruit and vegetables should be eaten every day in order to reduce the risk of many chronic diseases such as heart disease, stroke and cancer by 20% (Department of Health 2007). It recommends that a variety of fruits and vegetables be eaten to make up 'Five a day' so that the maximum benefits can be obtained by the interaction of various components that are present in them (Department of Health 2007). Q26a and 26b asked the participants the **'number of times'** that they usually ate fruit/vegetables rather than the 'portions' of fruit. This was done given the difficulty of defining 'a portion' for all the different fruit and vegetables and the length of the questionnaire which needed to be kept compact so as not to compromise the response rates. The 'number of times' (assuming only one fruit or vegetable is eaten at any one time) gave an opportunity to approximate their fruit and vegetable intake. Consequently, for this study, eating fruits

three times a day was coded as eating ‘adequate fruit’ and similarly eating vegetables three times a day was coded as eating ‘adequate vegetables’. Further, these two new variables (‘adequate fruit’ and ‘adequate vegetables’) were combined to get ‘overall adequate fruit and vegetables’ which would indicate a mixture of fruits and vegetables eaten at least six times a day (assuming that only one fruit or vegetable was eaten at any one time) giving a conservative measure of the fruit and vegetable consumption. Given the limitation of the phrasing of the question, there was no opportunity to analyse these in greater detail.

4.1.1b Meal pattern (Questions 27, 29 and 31): Three questions asked about the frequency of eating breakfast, lunch and dinner in a week. To get the regularity of the meals, those who had breakfast/lunch/dinner either everyday or 3-6 times a week were regrouped into new variables such as ‘regular breakfast’, ‘regular lunch’ or regular dinner’ respectively. Further a new variable was created to get a regular meal pattern. Those who had regular breakfast and lunch and dinner either everyday or 3 -6 times a week were grouped into having a ’regular meal pattern’.

4.1.1c Snacking behaviour (Question 35): Q35 asked the participants the number of times they had a snack each day, apart from their main meals. The snacks were divided into chocolate bars/sweets, crisps/savoury snacks, sugary fizzy drinks, diet/sugar free fizzy drinks and fruit juice/diluting juice. Each of these had an option for selecting ‘none’ up to having ‘more than 3’ snacks. Initially, the total number of snacks was calculated, which ranged from ‘none’ to ‘more than 25 snacks’ a day irrespective of what they ate. Further, using the ‘ntiles’ facility in SPSS, these were regrouped into a new variable categorised into ‘low snacking’ if they had 0-3 snacks a day, ‘medium snacking’ if they had 4-5 snacks a day, ‘high snacking’ if they had more than 6 snacks a day.

4.1.2 Physical activity behaviour

Three questions (q41, 45 and 46) from the original questionnaire were relevant to assess physical activity (PA) behaviour of young people.

4.1.2a Active behaviour (Question 41): Q41 asked the participants the number of days per week that they participated in physical activity as recommended by the national guidelines (Department of Health 2004). The Department of Health recommends that adults should participate in physical activity for a minimum of 30 minutes a day on at least five days or more a week, performed at a moderate intensity (activity which increases heart rate but not to leave you exhausted). Physical activity might include sports, recreational activity and general active living. To see if young people comply with the guidelines, those who only did moderate levels of physical activity up to 4 days a week were grouped together and created a new variable as having 'inadequate exercise'. Conversely those who did achieve the recommendations, i.e. moderate activity on 5-6 days per week were grouped as having 'adequate exercise'

4.1.2b Sedentary behaviour (Questions 45 and 46): Q45 and 46 addressed the sedentary behaviour of the participants. They asked about the number of hours in a day that the participants spent either watching TV or were on computer/games consoles. Each were regrouped into new variables 'Less than half an hour', '1 - 4 hours' or '>4 hours'.

4.2 Prevalence of health factors

4.2.1 Prevalence of overweight/obesity using Body Mass Index

BMI was calculated using the self reported height and weight given by the young people. According to WHO guidelines, prevalence of overweight (OW) or obesity in 18-25 year olds was 22%. 41.8% were of acceptable BMI and 28.9% were underweight (Table 4.1).

Table 4.1 Self reported prevalence of obesity in young people

Obesity	Frequency	Percentages
BMI categories (according to self reported height and weight)		
Underweight	379	28.9%
Acceptable weight	549	41.8%
Overweight	199	15.2%
Obese	89	6.8%
Missing	97	7.4%

4.2.2 Diet behaviour

Three diet behaviours were assessed: fruit and vegetable consumption, meal eating pattern and snacking. The definitions and groupings are detailed in section 4.1.1 and the results are presented in Table 4.2. These results show that only 28.3% ate adequate amount of fruit, only 27.8% consumed adequate amount of vegetables every day and when combined (at least three fruits and three vegetables a day), only 39.8% ate adequate amounts of fruit and vegetable. The majority of young people seemed to eat lunch (86.5%) and dinner (96.4%) more regularly than breakfast (63.7%). When the new variable 'regular meal pattern' (three meals either every day or 3-6 times a week) was investigated, it indicated that 58.8% had regular meal patterns. The level of snacking was high among young people with approximately two thirds of them (60.4%) having 4 snacks or more in a day. These snacks were mostly unhealthy such as chocolate bars/sweets, crisps or savoury snacks, sugary fizzy drinks. Three quarters of young people (75.1%) claimed that their main meal was cooked from fresh ingredients; 22.8% ate prepared convenience food and only 1.2% had takeaway food as their main meal.

Table 4.2 Diet behaviour

Diet behaviour	Frequency	Percentages
Fruit consumption		
Adequate fruit	371	28.3%
Inadequate fruit	824	62.8%
Missing	118	9.0%
Vegetable consumption		
Adequate vegetable	365	27.8%
Inadequate vegetable	842	64.1%
Missing	106	8.1%
Overall fruit and vegetable consumption	522	39.8%
Adequate fruit and vegetable	696	53.0%
Inadequate fruit and vegetable	95	7.2%
Missing		
Breakfast		
Regular breakfast	836	63.7%
Irregular breakfast	412	31.4%
Missing	65	5.0%
Lunch		
Regular lunch	1136	86.5%
Irregular lunch	109	8.3%
Missing	68	5.2%
Dinner		
Regular dinner	1266	96.4%
Irregular dinner	36	2.7%
Missing	11	0.8%
Meal pattern		
Regular meals everyday	772	58.8%
Irregular meals everyday	541	41.2%
Snacking		
Low (None to 3)	437	33.3%
Medium (4 or 5)	378	28.8%
High (6 or more)	415	31.6%
Missing	83	6.3%
Type of food		
Cooked from fresh ingredients	986	75.8%
Prepared convenience food	299	22.8%
Takeaway food	16	1.2%

Adequate fruit: Eat fruit 3 or more times a day; Adequate vegetables: Eat vegetables 3 or more times a day ; Overall adequate fruit and vegetables: Eat a mixture of fruit and vegetable 6 times a day.

4.2.3 Physical activity behaviour

The level of physical activity was low among young people with only 28.1% of them being 'physically active' as recommended by the national guidelines (Table 4.3). Looking at sedentary behaviour, the results show that 61.1% of young people watch TV for 1-4 hours with 7.5% watching for more than 4 hours a day. Similarly 43.8% of young people were on computer/games console for 1-4 hours with 13.9% of them for more than four hours a day.

Table 4.3 Physical activity behaviour

Physical activity behaviour	Frequency	Percentages
Active behaviour - exercise		
Adequate exercise	369	28.1%
Inadequate exercise	933	79.1%
Missing	11	0.8%
Sedentary behaviour-TV watching		
Less than half an hour a day	408	31.1%
1 to 4 hours a day	802	61.1%
More than 4 hours a day	99	7.5%
Missing	4	0.3%
Sedentary behaviour- computer or games console		
Less than half an hour a day	548	41.7%
1 to 4 hours a day	575	43.8%
More than 4 hours a day	182	13.9%
Missing	8	0.6%

4.2.4 General health perception

Participants were asked about how they would consider their health to be: very good, good, average or poor. This has already been discussed up to a point when considering the other health behaviour variables. However, this section completes the analysis of general health. In the main, the majority of young people (71%) perceived their general health to be very good or good (Table 4.4).

Table 4.4 Self reported perception of general health in young people

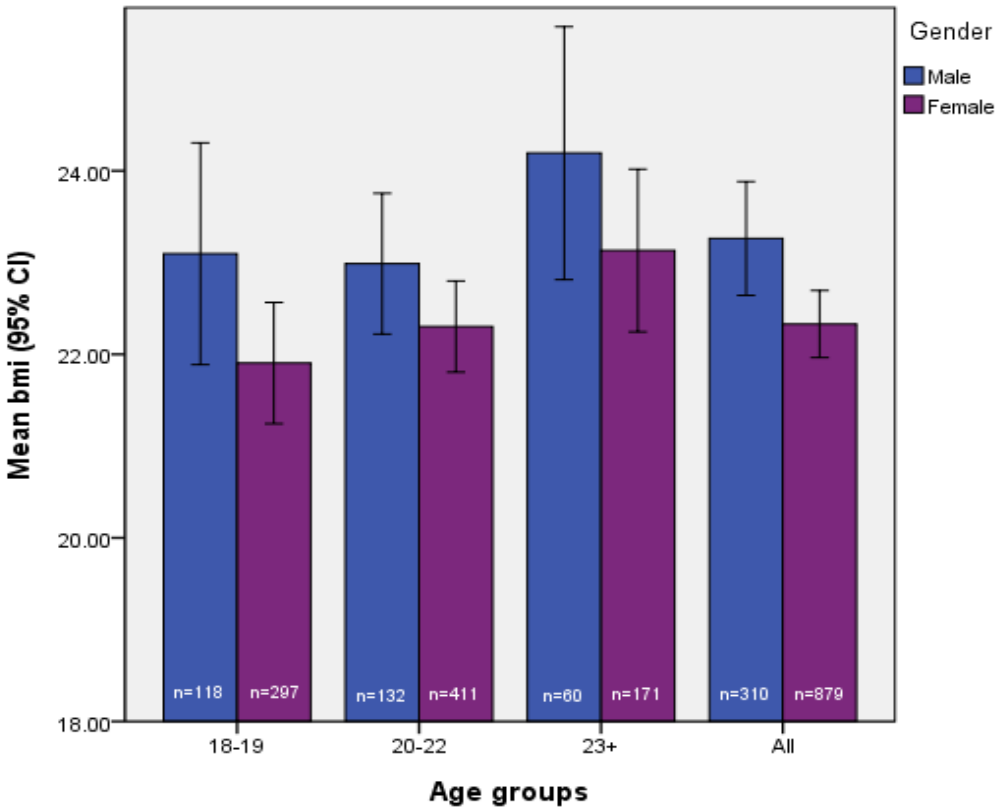
General health perception	Frequency	Percentages
Very good	236	18.0%
Good	697	53.2%
Average	326	24.9%
Poor	52	4.0%
Missing	2	0.2%

4.3 Health factors and its associations

4.3.1 BMI and its associations

4.3.1a Association between BMI and demographic/lifestyle factors: Body Mass Index was significantly associated with age, gender, employment/study status and level of education (Appendix 3.1, pg 375). Overweight and obesity levels among young people increased with age with males having on average higher BMI's compared to females (9.4% vs 6.8%) (Figure 4.1). Within this stage of the life course, 18 -25 year olds go through and achieve various developmental tasks leading to significant maturation that might impact on BMI levels, which in this thesis might be reflected as purely an ageing process. For example, they become more conscious of physique and body image, build social networks, develop values and gain a perspective of their future and set goals for themselves. In addition, the effect of age on BMI in this study may also have been confounded by educational level and socio economic status as many of the participants were young people from further and higher education. Young people who were employed showed lower levels of obesity compared to students who were also employed and those who were unemployed or ill. Among students, the levels of overweight and obesity were higher for those at post graduate level (33%) compared to those at foundation levels (26%). Although there is a trend in increasing BMI trend with levels of smoking, it was not statistically significant nor was there a significant association found between the level of alcohol consumption and BMI. Young people who perceived their general health to be poor had higher BMI levels compared to those who felt that they had a very good health.

Figure 4.1 Mean BMI across different age groups among 18-25 year olds



4.3.1b Association between BMI and diet behaviour: The association between BMI and diet behaviour is show in Table 4.5.

Table 4.5 Association between BMI and diet behaviour

	BMI CATEGORIES				
DIET BEHAVIOUR	**Underweight**	**Normal**	**Overweight**	**Obese**	**Significance p-value†**
Fruit and vegetable					
Adequate	160 (32.9%)	220 (45.2%)	71 (14.6%)	36 (7.4%)	
Inadequate	193 (29.8%)	299 (46.1%)	110 (17.0%)	46 (7.1%)	0.586
Meal pattern					
Regular	201 (27.4%)	357 (48.6%)	133 (18.1%)	43 (5.9%)	
Irregular	178 (36.9%)	192 (39.8%)	66 (13.7%)	46 (9.5%)	<0.001
Snacking					
Low (none to 3)	135 (32.5%)	193 (46.5%)	63 (15.2%)	24 (5.8%)	
Medium (4 or 5)	116 (32.8%)	162 (45.8%	52 (14.7%)	24 (6.8%)	
High (6 or more)	108 (28.9%)	161 (43.0%)	70 (18.7%)	35 (9.4%)	0.272

† All P values were based on Pearson Chi-square test unless otherwise highlighted

There was no significant association between BMI and fruit and vegetable consumption in young people. However, the level of obesity was significantly higher for those with irregular

meal eating patterns. Although the increasing trend in obesity as snacking increased was a statistically non significant result, there was a significant link observed between meal patterns and snacking as shown in Table 4.6.

Table 4.6 Association between meal pattern and snacking behaviour

	Low snacking (None to 3)	Medium snacking (4 or 5)	High snacking (6 or more)	Significance p-value†
Meal pattern				
Regular	295 (40.5%)	236 (32.4%)	198 (27.2%)	<0.001
Irregular	142 (28.3%)	142 (28.3%)	217 (43.3%)	

† Pearson Chi –square test

4.3.1c Association between BMI and physical activity behaviour: BMI was significantly associated with all three physical activity behaviours (Table 4.7). Low levels of obesity were observed in those who did adequate exercise compared to those who did not do adequate exercises with a similar pattern in overweight participants. Sedentary behaviour such as TV watching and being on the computer or games console was also significantly associated with BMI. The levels of obesity increased steadily with TV watching with 5.7% of participants being obese among those who watched TV for less than an hour which tripled among those who watched TV for more than four hours a day. A similar pattern was observed with time spent on computer/ games consoles.

Table 4.7 Association between BMI and physical activity behaviour

	BMI CATEGORIES				
PHYSICAL ACTIVITY	**Underweight**	**Normal**	**Overweight**	**Obese**	**Significance p-value†**
Exercise					
Adequate	124 (36.8%)	160 (47.5%)	44 (13.1%)	9 (2.7%)	
Inadequate	253 (29.1%)	387 (44.6%)	150 (17.3%)	78 (9.0%)	<0.001
TV watching					
< Half an hour	122 (31.9%)	179 (46.7%)	60 (15.7%)	22 (5.7%)	
1 - 4 hours a day	227 (30.5%)	344 (46.2%)	119 (16.0%)	55 (7.4%)	0.020
> 4 hours a day	29 (34.5%)	24 (28.6%)	19 (22.6%)	12 (14.3%)	
Computer/games					
< Half an hour	180 (35.4%)	228 (44.8%)	67 (13.2%)	34 (6.7%)	
1 - 4 hours a day	156 (29.2%)	246 (46.1%)	96 (18.0%)	36 (6.7%)	0.022
> 4 hours a day	42 (25.5%)	71 (43.0%)	34 (20.6%)	18 (10.9%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted

4.3.2 Diet behaviour and its associations

4.3.2a Association between diet behaviour and demographic/lifestyle factors: Levels of fruit and vegetable consumption was only significantly associated with smoking status (Appendix 3.2, pg 376) with nearly 70% of young people who smoked more than 5 cigarettes a day not eating adequate amounts of fruit and vegetables. All the demographic and life style factors except age were significantly associated with meal eating patterns. Males, young people who were employed, students in foundation years, those who lived alone, heavy smokers and heavy drinkers were all independently associated with being irregular meal eaters (Appendix 3.2 *b,* pg.377). Young people studying health related subjects tended to have more regular eating patterns compared to the science or arts students.

Snacking behaviour was significantly associated with age, gender, employment status, level of education and smoking status (Appendix 3.2 *c,* pg.*378*). Higher snacking levels were independently observed among the younger age group (18-19 year olds), males, those young people who were employed, students in foundations years and heavy smokers. Unlike meal eating pattern, snacking was not significantly associated with the subject area of the students, living arrangements or alcohol consumption.

4.3.2b Association between diet and physical activity behaviours: The associations between diet and physical activity behaviour is summarised in Table 4.8. Adequate activity levels were significantly associated with adequate fruit and vegetable consumption and lower snacking behaviour. No such association was observed with regularity of meals.

Sedentary TV watching was significantly associated with meal eating patterns and snacking. Those watching TV for more than four hours a day tended to have irregular meal eating patterns and snacked heavily compared to those who watched TV for less than half an hour a day. However, fruit and vegetable eating was not associated with TV watching and sedentary behaviour due to being on the computer or the game consoles was not associated with any of the diet behaviours.

Table 4.8 Association between diet and physical activity behaviours

a. With fruit and vegetable consumption

	FRUIT AND VEGETABLE CONSUMPTION		
PHYSICAL ACTIVITY	**Adequate fruit and vegetables**	**Inadequate fruit and vegetables**	**Significance p value†**
Exercise			
Adequate	183 (52.9%)	163 (47.1%)	<0.001‡
Inadequate	334 (38.7%)	528 (61.3%)	
TV watching			
< Half an hour	176 (45.6%)	210 (54.4%)	
1 - 4 hours a day	318 (42.5%)	430 (57.5%)	0.141
> 4 hours a day	27 (33.8%)	53 (66.3%)	
Computer/games			
< Half an hour	224 (43.4%)	292 (56.6%)	
1 - 4 hours a day	234 (43.3%)	306 (56.7%)	0.731
> 4 hours a day	62 (40.0%)	93 (60.0%)	

b. With meal pattern

	MEAL PATTERN		
PHYSICAL ACTIVITY	**Regular**	**Irregular**	**Significance p value†**
Exercise			
Adequate	231 (62.6%)	138 (37.4%)	0.108‡
Inadequate	537 (57.6%)	396 (42.4%)	
TV watching			
< Half an hour	263 (64.5%)	145 (35.5%)	<0.001
1 - 4 hours a day	466 (58.1%)	336 (41.9%)	
> 4 hours a day	41 (41.4%)	58 (58.6%)	
Computer/games			
< Half an hour	317 (57.8%)	231 (42.2%)	0.791
1 - 4 hours a day	344 (59.8%)	231 (40.2%)	
> 4 hours a day	108 (59.3%)	74 (40.7%)	

c. With Snacking behaviour

	SNACKING			
PHYSICAL ACTIVITY	**Low (none to 3)**	**Medium (4 or 5)**	**High (6 or more)**	**Significance p value†**
Exercise				
Adequate	147 (43.4%)	101 (29.8%)	91 (26.8%)	0.001
Inadequate	288 (32.7%)	274 (31.1%)	320 (36.3%)	
TV watching				
< Half an hour	195 (50.4%)	107 (27.6%)	85 (22.0%)	
1 - 4 hours a day	220 (29.5%)	250 (33.5%)	277 (37.1%)	<0.001
> 4 hours a day	20 (21.7%)	20 (21.7%)	52 (56.5%)	
Computer/games				
< Half an hour	180 (35.4%)	164 (32.2%)	165 (32.4%)	
1 - 4 hours a day	192 (35.6%)	166 (30.8%)	181 (33.6%)	0.532
> 4 hours a day	63 (36.0%)	45 (25.7%)	67 (38.3%)	

† All P values were based on Pearson Chi–square test unless otherwise highlighted
‡ Continuity correction (2x2 table)

4.3.2c Association between diet behaviour and general health: Perception of general health in young people was significantly associated with all three diet behaviours. The results presented in Table 4.9 show that young people who perceive their health to be very good tended to eat adequate fruits and vegetables (55.1%), had more regular eating pattern (64.8%) and snacked less (44%) compared to those who perceive their health to be poor.

Table 4.9 Association between diet behaviour and general health

a. With fruit and vegetable consumption

	FRUIT AND VEGETABLE CONSUMPTION		
GENERAL HEALTH	**Adequate fruit and vegetables**	**Inadequate fruit and vegetables**	**Significance p value†**
Very Good	124 (55.1%)	101(44.9%)	
Good	277 (42.0%)	382 (58.0%)	
Average	106 (36.4%)	185 (63.6%)	<0.001
Poor	14 (34.1%)	27 (65.9%)	

b. With meal pattern

	MEAL PATTERN		
GENERAL HEALTH	**Regular**	**Irregular**	**Significance p value†**
Very Good	153 (64.8%)	83 (35.2%)	
Good	439 (63.0%)	258 (37.0%)	
Average	159 (48.8%)	167 (51.2%)	<0.001
Poor	19 (36.5%)	33 (63.5%)	

c. With snacking behaviour

	SNACKING			
GENERAL HEALTH	**Low (none to 3)**	**Medium (4 or 5)**	**High (6 or more)**	**Significance p value†**
Very Good	96 (44.0%)	70 (32.1%)	52 (23.9%)	
Good	253 (38.4%)	183 (27.8%)	222 (33.7%)	<0.001
Average	72 (23.6%)	112 (36.7%)	121 (39.7%)	
Poor	15 (31.9%)	12 (25.5%)	20 (42.6%)	

† Pearson Chi-square test

4.3.3 Physical activity behaviour and its associations

4.3.3a Association between physical activity behaviour and demographic/lifestyle factors: Of all the demographic factors, only gender and the subject studied by students had significant associations with exercise levels. Males and students studying health related subjects seemed to participate in adequate levels of exercise as recommended by the national guidelines. Although non-significant, there was a decreasing trend in exercise levels with age (Appendix 3.3, pg 379).

Young men and those who were unemployed and/or ill watched TV and spent time on computer/game consoles for more than four hours as day. However, full time employed young people watched 1-4 hours of TV but spent less time on computer/games. While foundation year students tended to watch more TV, post graduate students (older) and the older age group (23+) spent more time on computers/ games. There was no association observed with age and TV watching. The heavy smokers tended to watch more TV but tended to spend less time on computers/ game consoles. Students studying health related subject spent less time on both watching TV and being on computers. No association was found either with living arrangement or alcohol consumption with sedentary behaviour.

4.3.3b Association between physical activity behaviour and general health: Perception of general health in young people was significantly associated with all three physical activity behaviours. The results presented in Table 4.10 show that amongst young people who perceive their health to be poor, 78% of them do not do enough exercise. However, levels of adequate activity were not high in any of the other groups either with only 41% of those who perceived their health to be very good and 29% of those who perceived their health as good doing an adequate amount of exercise.

Looking at sedentary behaviour, young people who perceived their health to be poor had significantly higher levels of TV watching and spent more time on computer/games compared to those who perceived their health to be good or very good.

Table 4.10 Associations between physical activity and general health

a. With Exercise

	EXERCISE LEVELS		
GENERAL HEALTH	**Adequate exercise**	**Inadequate exercise**	**Significance p value†**
Very Good	96 (41.0%)	138 (59.0%)	
Good	201(29.0%)	492 (71.0%)	
Average	61 (18.9%)	261 (81.1%)	<0.001
Poor	11 (21.6%)	40 (78.4%)	

b. With sedentary behaviour – TV watching

	SEDENTARY BEHAVIOUR-TV WATCHING			
GENERAL HEALTH	**< half an hour a day**	**1 to 4 hours a day**	**>4 hrs a day**	**Significance p value†**
Very Good	92 (39.1%)	137 (58.3%)	6 (2.6%)	
Good	218 (31.4%)	433 (62.3%)	44 (6.3%)	
Average	85 (26.2%)	207 (63.7%)	33 (10.2%)	<0.001
Poor	11 (21.2%)	25 (48.1%)	16 (30.8%)	

c. With sedentary behaviour – Computer/games console

	SEDENTARY BEHAVIOUR- COMPUTER/GAMES CONSOLE			
GENERAL HEALTH	**< half an hour a day**	**1 to 4 hours a day**	**>4 hrs a day**	**Significance p value†**
Very Good	107 (45.5%)	101 (43.0%)	27 (11.5%)	
Good	286 (41.3%)	322 (46.5%)	85 (12.3%)	
Average	132 (40.7%)	138 (42.6%)	54 (16.7%)	0.013
Poor	23 (45.1%)	14 (27.5%)	14 (27.5%)	

† All P values were based on Pearson Chi–square test

4.3.4 General health perception and its associations

4.3.4a Association between general health perception and demographic/lifestyle factors:

General health was significantly associated with employment/ study status, students subject area, smoking and alcohol but was not with age, gender, level of education or living arrangement (Appendix 3.4, pg.382). Generally, young people who were either unemployed or ill, students who were studying arts, heavy smokers or heavy drinkers tended to perceive their health to be poor.

4.4 Summary

The prevalence of overweight/obesity in young people between the ages of 18-25 is 22%. BMI was significantly associated with all three physical activity behaviours with lower levels of overweight/obesity amongst those doing adequate amounts of exercise along with less sedentary behaviour. Considering diet behaviour, regular meal patterns were significantly associated with lower levels of obesity. Although snacking itself was not associated with BMI, there was a significant relationship between meal eating patterns and snacking, with higher levels of snacking amongst irregular meal eaters. Associations between diet and physical activity showed that those doing adequate amounts of physical activity also tended to eat more fruit and vegetables and snacked less but no association was found between meal eating patterns and levels of exercise. High levels of TV watching were associated with irregular meal eating and high snacking but not with fruit and vegetable consumption. Nor was there any association between the time spent on computer/games and any of the diet behaviours.

The younger participants (18 - 19 year olds) had lower levels of obesity which may suggest it increases with age. The levels of active exercise tended to decrease for the older age groups, albeit not significantly. Age was not associated with TV watching but there was a significant increase in sedentary behaviour due to computer/games in 23+ group compared to 18-19 year olds. The level of snacking was also highest among the 18-19 year olds. Although self reported snacking fell with age, increased levels of sedentary behaviour and possible effects of previous snacking behaviour may have led to slight weight increase seen in the older age groups.

Males have higher level of obesity compared to females. Looking at their lifestyle factors, males are irregular meal eaters, heavy snackers and also eat less fruit and vegetables. Although males do more exercise, they also watch more TV and/or are on computer/games for longer every day.

Unemployed or ill young people, not surprisingly, have high levels of obesity and also have high levels of sedentary behaviour both by watching TV and being on computers/games for more than four hours a day. Young people employed full time, however, behaved differently. Their level of obesity was the lowest, despite being irregular meal eaters and high snackers. However, they did spend less time on computer/game consoles and watched less TV. There was no significant difference in the exercise levels between the employed and other groups (students, unemployed or ill).

Among students, those who are at foundation level (generally in younger category) were less overweight compared to those in post graduate education (older). However, the foundation year students were irregular meal eaters, heavy snackers and more sedentary. Although post graduate students watched less TV, ate more regularly and snacked less, they did spend more time on computers/games, which may have been work or study related. There was no difference in exercise levels between foundation year and postgraduate students. Although there was no significant association between obesity and the subject area of students, those studying health related subjects were more likely to be regular meal eaters, be more active and have less sedentary behaviour. Living arrangement (living alone or with other people) was not related to any health behaviour except that those living with others tended to have more regular meal eating patterns. Smoking was not significantly associated with obesity despite heavy smokers eating less fruit and vegetables, having irregular eating patterns, being heavy snackers and watching more TV. Similarly, alcohol was not associated with either obesity or physical activity behaviour. Like heavy smokers, heavy drinkers were also seen to have irregular meal eating patterns. The summary of BMI, diet and physical activity behaviours and its associations are presented graphically in Tables 4.11, 4.12 and 4.13 respectively.

Table 4.11 Health factors and its demographic associations

STATISTICALLY SIGNIFICANT **STATISTICALLY NON-SIGNIFICANT**

	DEMOGRAPHIC AND LIFESTYLE FACTORS							
HEALTH BEHAVIOURS	**Age**	**Gender**	**Employ/study status**	**Level of education**	**Study subject**	**Living arrangement**	**Smoking**	**Alcohol**
BODY MASS INDEX (BMI)	Higher in 23+	Higher in Males	-Higher in ill/unemployed -Low in employed	OW/Obesity higher in Foundation			# Increased trend Heavy smokers are more obese	
DIET **Fruit and veg consumption**		# Lower in males		# Less in foundation			Heavy smokers ate less fruit/vegetables	
Meal pattern		Males irregular	Employed irregular	Foundation irregular	Health related more regular	Alone - irregular	Heavy smokers-irregular	Heavy drinkers irregular
Snacking	Higher in 18-19 yrs	Higher in Males	Higher in employed	Higher in Foundation			Higher in heavy smokers	
PA **Exercise**	# Levels decrease in 23+	**Higher in Males**			Health related-more exercise			
TV watching		Higher in Males	-Higher in ill/unemployed -Employed watch more TV	Higher in Foundation	Health related-less TV		Heavy smokers - Watch More TV	
Computer/ game console	Higher in 23+	Higher in Males	-Higher in ill/unemployed -Employed less on computers	Higher in post graduates	Health related-less on computer/games		Heavy smokers - less on computer/games	
GENERAL HEALTH			ill/unemployed - poor		Arts related - poor		Heavy smokers-poor	Heavy drinkers-poor

Statistically non-significant but there was a trend

Table 4.12 Relationship between body mass index and health behaviours

BMI with diet	Fruit and vegetable consumption	Meal pattern – regular are less obese	Snacking
BMI with physical activity	Active exercise – less obese	Sedentary TV watching - more obese	Sedentary computer and games console – more obese
BMI with general health	Poor general health had higher BMI		

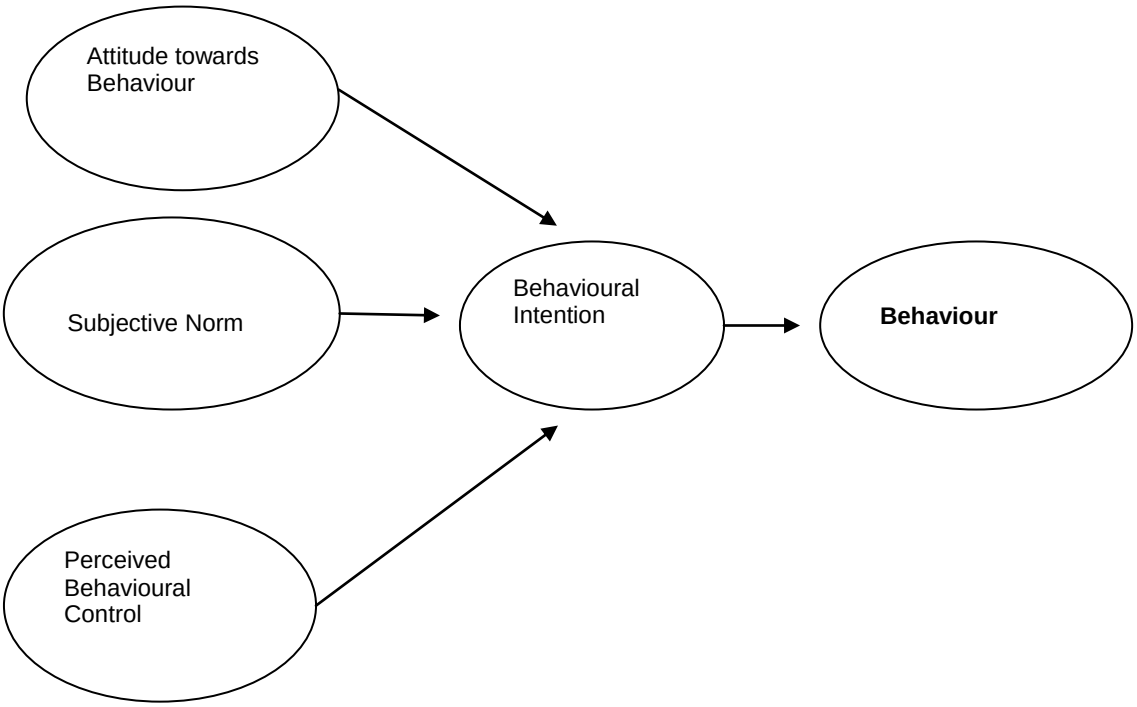
Table 4.13 Relationship between diet and physical activity behaviours

	PHYSICAL ACTIVITY		
DIET	***Active exercise***	***Sedentary TV watching***	***Sedentary computer and game console***
Fruit and vegetable consumption	Active people also eat adequate fruit and Vegetables		
Meal pattern		More TV watching - eat irregularly	
Snacking	Active people snack less	More TV watching - snack more	

Chapter 5: Results – Attitudes/subjective norm/perceived behavioural control and Intentions of young people towards healthy eating and active lifestyle

According to Theory of Planned Behaviour, one of the behavioural theories used to underpin the questionnaire, an individual's behaviour is informed by their intentions. Behavioural intention is in turn influenced by attitudes towards behaviours, subjective norms (beliefs about what is expected of them and the motivation to comply with other people's wishes) and perceived behaviour control (the amount of personal control a person feels they have for a particular behaviour). This chapter analyses and presents the attitudes, subjective norm and perceived behaviour control (PBC) of young people towards the behaviours of healthy eating and active lifestyle individually, initially as their associations with the behavioural intentions and then with the actual diet and physical activity behaviours.

Figure 3.2 (repeated) Theory of Planned Behaviour



5.1 Recoding/regrouping of the questions on attitudes, subjective norm and perceived behavioural control

5.1.1 Attitudes

Attitudes of young people towards diet and physical activity were measured using one question each, from each of the relevant sections of the questionnaire as detailed below. Other questions in the 'general health' section were used for establishing weight perception. The questions and the recoding of the questions are presented below (please refer to Appendix 2.3, pg 330 for the actual questions).

5.1.1a Diet attitude (Question 36): Q 36 was a validated question to assess the attitudes of young people about eating fruit and vegetables using the 'Five a day' as a surrogate measure of healthy eating. Attitude was assessed using four components – unpleasant/pleasant, worthless/worthwhile, unhealthy/healthy and stupid/clever. Each component was assessed on a scale of 1 to 5 (e.g. 1 is unpleasant and 5 is pleasant). The original coding was retained. However, during analysis if expected counts in individual cells were small, then groups 1 and 2 were combined together to make the analysis valid. This regrouping was approved by the health psychologists and retains the 'no opinion' group.

5.1.1b Physical activity attitude (Question 42): Q 42 was also a validated question this time assessing attitudes of young people about being adequately active (30 minutes of moderate physical activity on at least five days a week as per the current recommendations). Physically active attitudes were assessed using four components – difficult/easy, relaxing/stressful, not enjoyable/enjoyable and unhealthy/healthy. Again these were assessed on a scale of 1 to 5 and the coding retained unless the expected counts in individual cells were small, then (as with diet) appropriate groups were combined as approved by the health psychologists at University of Aberdeen.

5.1.1c Weight perception (Question 13): Q 13 asked if young people felt they were 'overweight', 'underweight', 'happy with body', 'fit and healthy', 'worried about gaining weight', 'unhappy if eat too much' and 'eat a well balanced diet'. Each of the statements had an option of 'yes' or 'no'.

For this question, the first two components were regrouped into one variable 'Weight perception' to give three categories 'overweight', 'underweight' and 'normal' (a third category created from those who said 'no' to being either underweight or overweight). The other statements in the same question were retained as indicators of body perception.

5.1.2 Subjective norm for diet and physical activity behaviour (Questions 38 and 47)

Two statements each from Q38 and Q47 assessed the subjective norm of young people (Appendix 2.3, pg.330) for healthy eating and doing adequate exercise respectively. These were not validated questions but developed with consensus of the health psychologists and subject experts from the steering group.

5.1.3 Perceived behavioural control (PBC) for physical activity (Question 43)

Q43 was a validated question to measure the perceived behavioural control that young people feel they have about being able to do adequate amounts of exercise. Again the original coding was retained, which for this construct was from 1 (not very confident) to 5 (very confidant). Unfortunately, no PBC question was included to assess this construct for diet.

5.1.4 Behavioural intention for diet and physical activity (Questions 37 and 44)

Q37 and Q44 were both validated questions assessing the intentions of young people to eat sufficient amounts of fruit and vegetables (five a day) and about doing adequate amounts of exercise respectively. The original coding of 1 (disagree) to 5 (agree) was retained.

5.2 Diet

5.2.1 Diet attitudes (eating 'five a day')

The attitudes of young people towards healthy eating were assessed in the context of eating 'five a day' using the four components. The term 'five a day' was explained in the questionnaire before the question. The results showed (Table 5.1) that the majority of young people thought that eating 'five a day' was pleasant (56.1%), worthwhile (71.7%), healthy (84.6%) and clever (73.6%).

Table 5.1 Attitude of young people to eating 'five- a-day' (fruit and vegetables)

Attitude	Frequency	Percentages
1 (Unpleasant)	44	3.4%
2	56	4.3%
3	207	15.8%
4	263	20.0%
5 (Pleasant)	737	56.1%
Missing	6	0.5%
1 (Worthless)	19	1.4%
2	30	2.3%
3	102	7.8%
4	209	15.9%
5 (Worthwhile)	941	71.7%
Missing	12	0.9%
1 (Unhealthy)	9	0.7%
2	10	0.8%
3	35	2.7%
4	136	10.4%
5 (Healthy)	1111	84.6%
Missing	12	0.9%
1 (Stupid)	16	1.2%
2	13	1.0%
3	102	7.8%
4	198	15.1%
5 (Clever)	966	73.6%
Missing	18	1.4%

5.2.2 Diet attitudes and its associations

5.2.2a Association between diet attitudes and demographic/lifestyle factors: The association between attitudes towards eating fruit and vegetables (five a day) and the demographic factors are presented in Appendix 4.1, pg 383. In all the four attitude components, females and students (particularly studying health related subject, except for healthy/unhealthy component) were significantly more positive. Fewer of the foundation year

students thought that eating five a day was pleasant and worthwhile compared to post graduate students and no association was found with the other two attitudes (stupid/clever and healthy/unhealthy). Age was not significantly associated with three of the attitudes (pleasant, worthwhile and healthy) although there was an increasing positive attitude as they grew older and the 23+ age group significantly thought that eating 'five a day' was clever compared to the younger age group. When it came to smokers, young people who smoked up to five cigarettes a day were more positive towards diet compared to non-smokers and heavy smokers. Finally, diet attitudes were not associated either with living arrangement or alcohol consumption.

5.2.2b Association between diet attitudes and diet intention: The results showed that there was a significant association between the positive attitudes towards eating five fruit and vegetables a day (i.e. pleasant, clever, healthy and worthwhile) and their intention to do so (Appendix 4.2, pg.387). It is worth noting that the sample sizes for the negative attitudes for two of the components (clever/healthy) were small. Despite regrouping, the expected counts were still low indicating use of Fisher's exact test. Unfortunately this test did not converge. However, the original Pearson's test for these were highly significant indicating that despite the statistical limitations there is likely to be an association.

5.2.2c Association between diet attitudes and diet behaviour: Associations between the attitudes towards eating fruit and vegetable (five a day) and the young people's actual diet behaviours was assessed and presented in Table 5.2. Most of the young people who ate adequate amounts of fruit and vegetables had positive attitudes towards eating five a day in all of the components. However, a significant number of young people who did not eat adequate amounts of fruit and vegetable still had positive attitudes for some components; 83% and 66% of those who did not eat adequate fruit and vegetable still thought doing so was 'healthy' and 'worthwhile'. Although only the attitudes towards eating fruit and vegetables were asked in the questionnaire, the associations of these with other eating behaviours (meal eating patterns and snacking) were also assessed. Those who had positive

attitudes towards eating fruit and vegetables also tended to be regular meal eaters. Looking at the snacking behaviour, as the levels of snacking increased from low to high, the positive attitudes towards eating 'five a day' significantly decreased for three out of the four components (unpleasant/pleasant, worthwhile/worthwhile and stupid/clever). For the unhealthy/healthy component, even the high snackers still considered eating 'five a day' to be healthy (83%) and their attitude was not significantly different to that of the low snackers (88%) attitude.

Table 5.2 Association between diet attitudes (fruit and vegetables) and diet behaviour

Diet behaviour	Diet attitudes (Five-a-day: fruit and vegetables)					
	Unpleasant	**2**	**3**	**4**	**Pleasant**	**Sig p value†**
Fruit and veg consumption						
Adequate	1 (0.2%)	3 (0.6%)	38 (7.3%)	84 (16.1%)	395 (75.8%)	
Not adequate	20 (2.9%)	39 (5.6%)	148 (21.4%)	167 (24.2%)	317 (45.9%)	<0.001
Meal pattern						
Regular	16 (2.1%)	23(3.0%)	106(13.7%)	152 (19.7%)	474 (61.5%)	
Irregular	28 (5.2%)	33 (6.2%)	101 (18.8%)	111 (20.7%)	263 (49.1%)	<0.001
Snacking						
Low	10 (2.3%)	13 (3.0%)	41 (9.4%)	84 (19.2%)	289 (66.1%)	<0.001
Medium	6 (1.6%)	17 (4.5%)	67 (17.8%)	73 (19.4%)	213 (56.6%)	
High	26 (6.3%)	23 (5.6%)	85 (20.6%)	89 (21.5%)	190 (46.0%)	
	Worthless	**2**	**3**	**4**	**Worthwhile**	**Sig p value†**
Fruit and veg consumption						
Adequate	1 (0.2%)	4 (0.8%)	18 (3.5%)	58 (11.2%)	437 (84.4%)	<0.001
Not adequate	6 (0.9%)	21 (3.1%)	64 (9.3%)	139 (20.2%)	458 (66.6%)	
Meal pattern						
Regular	5 (0.7%)	12 (1.6%)	45 (5.9%)	113 (14.7%)	593 (77.2%)	<0.001
Irregular	14 (2.6%)	18 (3.4%)	57 (10.7%)	96 (18.0%)	348 (65.3%)	
Snacking						
Low	2 (0.5%)	6 (1.4%)	29 (6.7%)	65 (14.9%)	333 (76.6%)	
Medium	5 (1.3%)	7 (1.9%)	30 (8.0%)	54 (14.4%)	278 (74.3%)	0.025
High	9 (2.2%)	15 (3.6%)	38 (9.2%)	76 (18.5%)	273 (66.4%)	
	Unhealthy	**2**	**3**	**4**	**Healthy**	**Sig p value†**
Fruit and veg consumption						
Adequate	4 (0.8%)		6 (1.2%)	38 (7.3%)	470 (90.7%)	0.002
Not adequate	9 (1.3%)		22 (3.2%)	84 (12.2%)	574 (83.3%)	
Meal pattern						
Regular	2 (0.3%)	4 (0.5%)	13 (1.7%)	71 (9.3%)	677 (88.3%)	0.001
Irregular	7 (1.3%)	6 (1.1%)	22 (4.1%)	65 (12.2%)	434 (81.3%)	
Snacking						
Low	2 (0.5%)	1 (0.2%)	5 (1.1%)	44 (10.1%)	383 (88.0%)	0.128
Medium	1 (0.3%)	3 (0.8%)	13 (3.5%)	35 (9.4%)	321 (86.1%)	
High	5 (1.2%)	5 (1.2%)	13 (3.2%)	47 (11.4%)	342 (83.0%)	
	Stupid	**2**	**3**	**4**	**Clever**	**Sig p value†**
Fruit and veg consumption						
Adequate	4 (0.8%)		17 (3.3%)	69 (13.4%)	424 (82.5%)	<0.001
Not Adequate	13 (1.9%)		69 (10.0%)	116 (16.9%)	489 (71.2%)	
Meal pattern						
Regular	6 (0.8%)	4 (0.5%)	47 (6.2%)	108 (14.1%)	599 (78.4%)	0.001
Irregular	10 (1.9%)	9 (1.7%)	55 (10.4%)	90 (16.9%)	367 (69.1%)	
Snacking						
Low	3 (0.7%)		33 (7.6%)	66 (15.2%)	332 (76.5%)	
Medium	8 (2.1%)		25 (6.7%)	53 (14.2%)	287 (76.9%)	0.033
High	16 (3.9%)		38 (9.3%)	67 (16.4%)	287 (70.3%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted

5.2.3 Diet subjective norm

Assessment of subjective norms for diet behaviour shows that meeting the expectations of others and the need to please and impress others were not very important factors for young people. However, many young people (83%) did not answer this question. Consequently, interpretation of the data for this construct should be viewed with caution (Table 5.3).

Table 5.3 Subjective norm for diet behaviour (five a day)

Subjective norm	Frequency	Percentages
Diet - subjective norm		
Important	94	7.2%
Not very important	129	9.8%
Missing	1090	83.0%

5.2.4 Diet subjective norm and its associations

5.2.4a Association between diet subjective norm and demographic/lifestyle factors:

The results show (Appendix 4.3, pg.388) that subjective norm is not associated with any of the demographic factors except for the level of education. This subjective norm seemed to be important for undergraduate level students but not as important for postgraduates.

5.2.4b Association between diet subjective norm and diet intention: Given the 17% response rate for this question, it would seem that subjective norm was not very important for young people. When analysed with the diet intention, although there was a significant association between subjective norm and their intention to eat five a day (Appendix 4.4, pg 388), the Fisher's exact test did not converge probably due to small sample size.

5.2.4c Association between diet subjective norm and diet behaviour: The results (Table 5.4) showed that this subjective norm was not related to any of the diet behaviours among young people.

Table 5.4 Associations between diet - subjective norm and diet behaviour

	Subjective norm - diet		
Diet behaviour	**Important**	**Not Very Important**	**Significance p value†**
Fruit and vegetable consumption			
Adequate	45 (45.9%)	53 (54.1%)	0.573‡
Not Adequate	44 (41.1%)	63 (58.9%)	
Meal pattern			
Regular	59 (43.7%)	76 (56.3%)	0.582‡
Irregular	35 (39.8%)	53 (60.2%)	
Snacking			
Low (none to 3)	25 (41.0%)	36 (59.0%)	
Medium (4 or 5)	29 (42.0%)	40 (58.0%)	0.928
High (6 or more)	34 (44.2%)	43 (55.8%)	

†Pearson Chi-squared; ‡ Continuity correction(2x2 table)

5.2.5 Diet intention (eating 'five a day')

Most of the young people in this survey (89%) agreed (4 and 5 on the scale) that they intended to eat 5 fruit and vegetables every day suggesting a strong intention of young people to have healthy diet (Table 5.5).

Table 5.5 Intention to eat 'five- a-day' (fruits and vegetables)

Intention	Frequency	Percentages
1 (Disagree)	22	1.7%
2	32	2.4%
3	81	6.2%
4	198	15.1%
5 (Agree)	970	73.9%
Missing	10	0.8%
Total	1313	100%

5.2.6 Diet intention and its associations

5.2.6a Association between diet intention and demographic/lifestyle factors: Appendix 4.5, pg.389, shows that the intention to eat '5 a day' was independently lower in the younger age group (18-19 year olds), males, foundation year students and in those who were unemployed and/or ill. Living arrangement, levels of smoking and/or alcohol consumptions did not have any relationship with intention to eat 5 a day.

5.2.6b Association between diet intention and diet behaviour: Generally, young people with a high intention to eat 'five a day' did tend to eat adequate amounts of fruit and vegetables. However, of those not eating adequate amounts of fruit and vegetables, 68% still

had high intentions to do so (Table 5.6) showing that intention does not necessarily transfer into behaviour. Assessing the association with other diet behaviours, those with better intentions to eat sufficient amounts of fruit and vegetables also had a regular eating pattern but there was no statistically significant association with snacking behaviour.

Table 5.6 Association between diet intention (five a day) and diet behaviour

Diet behaviour	**Diet intention (Five-a-day: fruit and vegetables)**					
	Disagree	**2**	**3**	**4**	**Agree**	**Significance P value†**
Fruit and veg consumption						
Adequate	3 (0.6%)	6 (1.2%)	11 (2.1%)	47 (9.1%)	452 (87.1%)	
Not Adequate	9 (1.3%)	19 (2.8%)	55 (8.0%)	137 (19.9%)	469 (68.1%)	<0.001
Meal pattern						
Regular	9 (1.2%)	15 (2.0%)	26 (3.4%)	110 (14.4%)	606 (79.1%)	<0.001
Irregular	13 (2.4%)	17 (3.2%)	55 (10.2%)	88 (16.4%)	364 (67.8%)	
Snacking						
Low	5 (1.2%)	7 (1.6%)	20 (4.6%)	70 (16.1%)	332 (76.5%)	
Medium	6 (1.6%)	10 (2.7%)	23 (6.1%)	55 (14.7%)	280 (74.9%)	0.325
High	9 (2.2%)	14 (3.4%)	33 (8.0%)	65 (15.7%)	292 (70.7%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted

For diet, the summary of relationship between the constructs of 'Theory of Planned Behaviour' and demographics, intention and diet behaviour is presented graphically in Tables 5.7, 5.8 and 5.9 respectively.

Table 5.7 DIET – Association between constructs of behavioural theory (Attitudes, Subjective Norm, Intention) and demographics

STATISTICALLY SIGNIFICANT **STATISTICALLY NON-SIGNIFICANT**

	DEMOGRAPHIC AND LIFESTYLE FACTORS							
DIET ATTITUDES	**Age**	**Gender**	**Employ/study status**	**Level of education**	**Study subject**	**Living arrangement**	**Smoking**	**Alcohol**
Unpleasant/pleasant		Females more positive	Students more positive	Foundation less positive	Health related more positive		1- 5 cigarettes more positive	
Worthless/worthwhile		Females more positive	Students more positive	Foundation less positive	Health related more positive		1- 5 cigarettes more positive	
Unhealthy/healthy		Females more positive	Students more positive				1- 5 cigarettes more positive	
Stupid/clever	23+ more positive	Females more positive	Students more positive		Health related more positive		1- 5 cigarettes more positive	
DIET SUBJECTIVE NORM				UG –important PG-not important				
DIET INTENTION	18-19 yrs – Lower	Males – Lower	Unemployed-lower	Foundation - Lower				

Table 5.8 DIET – Association between constructs of behavioural theory (Attitudes, Subjective Norm) and diet Intention

	DIET INTENTION
DIET ATTITUDES	
Unpleasant/pleasant	
Worthless/worthwhile	
Unhealthy/healthy	€
Stupid/clever	€
DIET SUBJECTIVE NORM	

€ >20% of the cells had an expected count less than 5 in spite of the grouping. Fisher's exact test did not converge

Table 5.9 Relationship between constructs of behaviour theory (including Intention) and diet behaviours

	DIET BEHAVIOUR		
DIET ATTITUDES	Fruit and vegetable consumption	Meal pattern	Snacking
Unpleasant/pleasant	Those who ate adequate fruit and vegetables had more positive attitudes	Those who had more positive attitudes were regular meal eaters	Low snackers-positive
Worthless/worthwhile			Low snackers-positive
Unhealthy/healthy			# All snackers thought - healthy
Stupid/clever			Low and medium snackers-positive
DIET SUBJECTIVE NORM			
DIET INTENTION	Strong intention- ate adequate fruit and vegetables	Strong intention – regular meal pattern	# Decrease intention with increased snacking

Statistically non significant but trend observed

5.3 Physical activity (PA)

5.3.1 Physical activity attitudes

Young people's attitudes towards doing adequate amounts of exercise as recommended by the national guidelines (Department of Health 2004) were assessed. The results showed (Table 5.10) that out of the four components (difficult/easy, relaxing/stressful, not enjoyable/enjoyable and unhealthy/healthy), only one component was seen to be positive; 66% of young people viewed doing moderate physical activity for 30 minutes on at least five days a week as being healthy. The results for other components were not as positive with only around 20% finding physical activity to be easy and relaxing and 30% who found doing exercise enjoyable. In fact, around 13% and 6% felt that doing exercise was difficult and stressful respectively.

Table 5.10 Attitude of young people to do exercise as recommended by national guidelines

Attitude	Frequency	Percentages
1 (Difficult)	165	12.6%
2	233	17.7%
3	359	27.3%
4	234	17.8%
5 (Easy)	306	23.3%
Missing	16	1.2%
1 (Relaxing)	261	19.9%
2	328	25.0%
3	465	35.4%
4	163	12.4%
5 (Stressful)	76	5.8%
Missing	20	1.5%
1 (Not enjoyable)	56	4.3%
2	135	10.3%
3	358	27.3%
4	350	26.7%
5 (Enjoy)	394	30.0%
Missing	20	1.5%
1 (Unhealthy)	11	0.8%
2	21	1.6%
3	111	8.5%
4	283	21.6%
5 (Healthy)	868	66.1%
Missing	19	1.4

5.3.2 Physical activity attitudes and its associations

5.3.2a Association between physical activity attitudes and demographic/lifestyle factors: Young people's attitudes towards doing physical activity (Appendix 4.6, pg.390) as being difficult/easy or healthy/unhealthy did not vary between younger and older age groups. While 70% of all age groups felt it was the healthy thing to do, only a quarter of all age groups stated that exercising was easy. However, it was the younger age groups that felt that physical activity was relaxing and enjoyable compared to the 23+ age group. Males felt that doing exercise was easy, relaxing and enjoyable. There was no such gender difference about physical activity being healthy with 2/3rds stating it to be healthy. Those who were employed felt that doing exercise was easy and students thought it was enjoyable. Generally those who were unemployed and/or ill were more likely to feel that physical activity was difficult and not enjoyable.

There was no significant association between the levels of education in terms of feeling that exercising was difficult/easy or healthy/unhealthy although undergraduates felt less stressed about doing adequate amounts of exercise and also felt that doing exercise was more enjoyable compared to the foundation and post graduate students. Among students, those studying health and science related subjects thought that doing adequate exercise was healthy. Young people living alone found doing adequate levels of exercise difficult and stressful compared to those living with others, while no significant association was found in terms of enjoyment and being healthy/unhealthy. Those who smoked more than five cigarettes a day (n=200) found that doing exercise was stressful, less enjoyable and fewer of them thought it to be healthy. There was no association between alcohol consumption levels and attitudes towards physical activity.

5.3.2b Association between physical activity attitudes and PA intention: Young people who felt that doing moderate amounts of exercises (30 minutes) on at least five days week was easy, relaxing, enjoyable or healthy also had a significantly strong intention to do physical activity. However, around 50% of 18-25 year olds who felt that doing adequate amount of exercise was difficult and stressful still had strong intentions. However, 44% of those who thought it was unhealthy had no intention to do sufficient amounts of exercise (Appendix 4.7, pg.394).

5.3.2c Association between physical activity attitudes and PA behaviour: The association between the attitudes towards doing adequate amounts of exercise along with both active and sedentary behaviours were assessed and presented in Table 5.11. Those who did adequate amounts of exercise significantly thought it was easy, relaxing, enjoyable or healthy. Those who did not do enough exercise felt that it was difficult, stressful or not enjoyable except for 62% of those who did not do adequate exercise and yet still conceded that adequate exercising was healthy.

Looking at sedentary behaviour by considering watching TV, then those who watched TV for more than four hours a day felt that doing adequate exercise was difficult, stressful and not enjoyable whereas 60 - 70% of them thought it was healthy. There was no significant association between attitudes towards physical activity and the time spent on computers/games consoles for three out of the four components (relaxing/stressful, enjoyable/not enjoyable and healthy/unhealthy and not difficult/easy). However, 30% of those who spent >4hours on computer/games thought it was easy to do adequate exercise despite their sedentary behaviour.

Table 5.11 Association between physical activity attitudes and physical activity behaviour

PA behaviour	Attitudes towards physical activity					
	Difficult	**2**	**3**	**4**	**Easy**	**Sig P value†**
Exercise						
Adequate	4 (1.1%)	10 (2.7%)	41 (11.3%	94 (25.8%)	215 (59.1%)	<0.001
Inadequate	159 (17.2%)	222 (24.0%)	316 (34.1%)	140 (15.1%)	89 (9.6%)	
TV watching						
< 1/2 hr a day	44 (10.9%)	67 (16.5%)	107 (26.4%)	83 (20.5%)	104 (25.7%)	
1-4 hrs /day	91 (11.5%)	149 (18.8%)	224 (28.2%)	144 (18.2%)	185 (23.3%)	<0.001
>4 hrs/day	29 (29.9%)	17 (17.5%)	27 (27.8%)	7 (7.2%)	17 (17.5%)	
Computer/ games						
< 1/2 hr a day	77 (14.2%)	99 (18.3%)	143 (26.4%)	89 (16.5%)	133 (24.6%)	0.023
1-4 hrs /day	57 (10.0%)	104 (18.3%)	168 (29.5%)	120 (21.1%)	120 (21.1%)	
>4 hrs/day	30 (16.6%)	30 (16.6%)	47 (26.0%)	23 (12.7%)	51 (28.2%)	
	Relaxing	**2**	**3**	**4**	**Stressful**	**Sig P value**
Exercise						
Adequate	130 (35.5%)	116 (31.7%)	89 (24.3%)	20 (5.5%)	11 (3.0%)	<0.001
Inadequate	129 (14.0%)	211 (22.9%)	374 (40.6%)	143 (15.5%)	64 (6.9%)	
TV watching						
< 1/2 hr a day	102 (25.1%)	117 (28.8%)	129 (31.8%)	39 (9.6%)	19 (4.7%)	
1-4 hrs /day	146 (18.5%)	192 (24.3%)	301 (38.1%)	107 (13.5%)	44 (5.6%)	<0.001
>4 hrs/day	13 (13.7%)	19 (20.0%)	34 (35.8%)	17 (17.9%)	12 (12.6%)	
Computer/ games						
< 1/2 hr a day	112 (20.7%)	141 (26.1%)	186 (34.4%)	67 (12.4%)	35 (6.5%)	
1-4 hrs /day	108 (19.0%)	148 (26.1%)	219 (38.6%)	69 (12.2%)	23 (4.1%)	0.120
>4 hrs/day	40 (22.3%)	37 (20.7%)	59 (33.0%)	26 (14.5%)	17 (9.5%)	
	Not Enjoyable	**2**	**3**	**4**	**Enjoyable**	**Sig P value**
Exercise						
Adequate	6 (1.6%)	7 (1.9%)	62 (17.0%)	104 (28.5%)	186 (51.0%)	<0.001
Inadequate	48 (5.2%)	128 (13.9%)	293 (31.8%)	246 (26.7%)	206 (22.4%)	
TV watching						
< 1/2 hr a day	12 (3.0%)	42 (10.4%)	93 (23.0%)	108 (26.7%)	149 (36.9%)	
1-4 hrs /day	30 (3.8%)	77 (9.7%)	243 (30.7%)	225 (28.4%)	216 (27.3%)	<0.001
>4 hrs/day	14 (14.6%)	15 (15.6%)	21 (21.9%)	17 (17.7%)	29 (30.2%)	
Computer/ games						
< 1/2 hr a day	22 (4.1%)	56 (10.4%)	137 (25.5%)	150 (27.9%)	173 (32.2%)	0.067
1-4 hrs /day	18 (3.2%)	58 (10.2%)	168 (29.6%)	161 (28.3%)	163 (28.7%)	
>4 hrs/day	15 (8.3%)	21 (11.6%)	49 (27.1%)	38 (21.0%)	58 (32.0%)	
	Unhealthy	**2**	**3**	**4**	**Healthy**	**Sig P value**
Exercise						
Adequate	1 (0.3%)	4 (1.1%)	16 (4.4%)	54 (14.8%)	290 (79.5%)	<0.001
Inadequate	9 (1.0%)	17 (1.8%)	93 (10.1%)	227 (24.6%)	576 (62.5%)	
TV watching						
< 1/2 hr a day	3 (0.7%)	7 (1.7%)	32 (7.9%)	90 (22.1%)	275 (67.6%)	
1-4 hrs /day	6 (0.8%)	11 (1.4%)	64 (8.1%)	176 (22.3%)	533 (67.5%)	0.198
>4 hrs/day	2 (2.1%)	3 (3.2%)	15 (15.8%)	17 (17.9%)	58 (61.1%)	
Computer/ games						
< 1/2 hr a day	5 (0.9%)	10 (1.8%)	42 (7.7%)	111 (20.4%)	375 (69.1%)	0.308
1-4 hrs /day	2 (0.4%)	8 (1.4%)	49 (8.7%)	131 (23.2%)	375 (66.4%)	
>4 hrs/day	4 (2.2%)	3 (1.7%)	20 (11.1%)	39 (21.7%)	114 (63.3%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted

5.3.3 Physical activity - subjective norm

Assessment of subjective norm for physical activity behaviour shows that this was not an important factor for young people; only one third felt it was important to meet others expectations and the need to please and/or impress others (Table 5.12).

Table 5.12 Subjective norm for physical activity behaviour

Subjective norm	Frequency	Percentages
PA - Subjective norm		
Important	200	15.2%
Mixed	251	19.1%
Not important	829	63.1%
Missing	33	2.5%

5.3.4 Physical activity subjective norm and its associations

5.3.4a Association between physical activity subjective norm and demographic/lifestyle factors: The results show (Appendix 4.8, pg.395) that the subjective norm for physical activity was more important for the younger age groups, males, those in foundation courses and students studying health related subjects. It was least important for non-smokers, which was marginally significant.

5.3.4b Association between physical activity subjective norm and PA intention: There was no significant association between the need to please and impress others and the intention to do adequate amounts of exercise (Appendix 4.9, pg.395)

5.3.4c Association between physical activity subjective norm and PA behaviour

As with diet, the physical activity subjective norm was not related to any of the actual physical activity behaviours among young people (Table 5.13).

Table 5.13 Associations between physical activity - subjective norm and PA behaviour

	Subjective Norm - PA			
Physical activity behaviour	**Important**	**Mixed**	**Not Important**	**Significance P value†**
Exercise				
Adequate	61 (16.6%)	80 (21.8%)	226 (61.6%)	0.329
Inadequate	137 (15.2%)	171 (18.9%)	596 (65.9%)	
TV watching				
< Half an hour	68 (17.0%)	73 (18.3%)	258 (64.7%)	
1 - 4 hours a day	119 (15.2%)	153 (19.6%)	510 (65.2%)	0.495
> 4 hours a day	13 (13.4%)	25 (25.8%)	59 (60.8%)	
Computer/games				
< Half an hour	74 (13.8%)	113 (21.0%)	350 (65.2%)	
1 - 4 hours a day	91 (16.2%)	105 (18.7%)	367 (65.2%)	0.413
> 4 hours a day	34 (19.3%)	33 (18.8%)	109 (61.9%)	

†Pearson Chi-squared

5.3.5 Physical activity - perceived behavioural control (PBC)

The perceived behavioural control is a construct that measures personal control over behaviour and was assessed for physical activity in young people. The results show (Table 5.14) that only one third of the young people felt highly confident about being moderately physically active for 30 minutes on at least five days a week.

Table 5.14 Perceived Behavioural Control (PBC) to do adequate exercise

Intention	Frequency	Percentages
1 (No confidence)	119	9.1%
2	152	11.6%
3	254	19.3%
4	336	25.6%
5 (High confidence)	439	33.4%
Missing	13	1.0%
Total	1313	100%

5.3.6 Perceived behavioural control (PBC) and its associations

5.3.6a Association between physical activity PBC and demographic/lifestyle factors:

The association between PBC and demographic factors are presented in Appendix 4.10, pg.396. Males and employed young people were highly confident about being able to do adequate amounts of exercise, where as those students studying science subjects were not very confident. There was a marginal significance with living arrangement, where by people living alone all the time were less confident about doing sufficient amounts of exercise while those living alone for most of the week (Mon-Fri) were reasonably confident.

5.3.6b Association between physical activity PBC and PA intention: There was a significant association between PBC and intentions (Appendix 4.11, pg.397). The majority of young people had strong intentions to do adequate amounts of exercise in spite of being less confident. Among those with high confidence (PBC), 4% of them had no intention and around 20% of them had less intention to exercise adequately.

5.3.6c Association between physical activity PBC and PA behaviour: Perceived behavioural control to do adequate amounts of physical activity was significantly associated with actual behaviour (Table 5.15). Young people with higher levels of confidence to control their behaviour also reported that they did achieve the actual recommended levels of exercising and in addition spent less time on computers or game consoles. Those who watched TV for more than four hours a day were less confident about doing enough exercise.

Table 5.15 Perceived Behavioural Control (PBC) to do physical activity and PA behaviour

	PBC to do physical activity					
Physical activity behaviour	**No confidence**	**2**	**3**	**4**	**High confidence**	**Sig P value†**
Exercise						
Adequate	4 (1.1%)	2 (0.5%)	24 (6.5%)	92 (25.1%)	245 (66.8%)	<0.001
Inadequate	113 (12.2%)	149 (16.1%)	230 (24.8%)	243 (26.2%)	191 (20.6%)	
TV watching						
< 1/2 hr a day	39 (9.6%)	44 (10.9%)	74 (18.3%)	112 (27.7%)	136 (33.6%)	0.002
1-4 hrs /day	59 (7.4%)	102 (12.8%)	159 (20.0%)	207 (26.0%)	269 (33.8%)	
>4 hrs/day	20 (20.6%)	6 (6.2%)	20 (20.6%)	17 (17.5%)	34 (35.1%)	
Computer/ games						
< 1/2 hr a day	57 (10.5%)	62 (11.4%)	79 (14.5%)	142 (26.1%)	205 (37.6%)	0.001
1-4 hrs /day	39 (6.8%)	72 (12.6%)	139 (24.4%)	146 (25.6%)	174 (30.5%)	
>4 hrs/day	22 (12.3%)	18 (10.1%)	34 (19.0%)	47 (26.3%)	58 (32.4%)	

† All P values were based on Pearson Chi-square test

5.3.7 Physical activity intention

Young people mostly agreed (81.4%) (4 and 5 on the scale) that they intended to do the recommended levels of 30 minutes of moderately intense exercise 5-7 days a week (Table 5.16).

Table: Intention to do adequate exercise (30 min of moderately intense exercise on at least 5-7 days a week)

Intention	Frequency	Percentages
1 (No intention)	30	2.3%
2	55	4.2%
3	149	11.3%
4	227	17.3%
5 (Strong Intention)	841	64.1%
Missing	11	0.8%
Total	1313	100%

5.3.8 Physical activity intention and its associations

5.3.8a Association between physical activity intention and demographic/lifestyle factors: Physical activity intention and associations with the demographic factors are presented in Appendix 4.12, pg.397. Students, and particularly those studying science subjects, had strong intentions to do exercise. Heavy smokers (more than five a day) showed no intention to do the recommended amounts of exercise. Those who were medium alcohol drinkers had less intention to do enough exercise compared to low and heavy drinkers.

5.3.8b Association between physical activity intention and PA behaviour: Physical activity intentions were significantly associated with the young people's actual behaviour (Table 5.17). Young people with stronger intentions did tend to achieve adequate levels of exercise. However, 57% of those not doing adequate amounts of exercise still had high intentions to do so, showing again that intention alone might not be sufficient to change behaviour. Those who either watched TV or spent time on computers or game consoles for more than 4 hours a day, tended to have lower intentions to do the recommended levels of physical activity.

Table 5.17 Physical activity intention and PA behaviour

	Physical activity intentions and PA behaviour					
Physical activity behaviour	**No intention**	**2**	**3**	**4**	**Strong intention**	**Sig P value†**
Exercise						
Adequate	0 (0%)	2 (0.5%)	22 (6.0%)	37 (10.1%)	305 (83.3%)	<0.001
Inadequate	29 (3.1%)	53 (5.7%)	126 (13.6%)	189 (20.3%)	532 (57.3%)	
TV watching						
< 1/2 hr a day	6 (1.5%)	13 (3.2%)	39 (9.7%)	76 (18.8%)	270 (66.8%)	
1-4 hrs /day	14 (1.8%)	36 (4.5%)	95 (11.9%)	138 (17.3%)	516 (64.6%)	<0.001
>4 hrs/day	10 (10.3%)	6 (6.2%)	15 (15.5%)	13 (13.4%)	53 (54.6%)	
Computer/ games						
< 1/2 hr a day	14 (2.6%)	31 (5.7%)	65 (11.9%)	79 (14.5%)	355 (65.3%)	0.004
1-4 hrs /day	9 (1.6%)	14 (2.4%)	55 (9.6%)	118 (20.6%)	377 (65.8%)	
>4 hrs/day	7 (3.9%)	10 (5.6%)	27 (15.1%)	29 (16.2%)	106 (59.2%)	

† All P values were based on Pearson Chi-square test

For physical activity, the summary of relationship between the constructs of 'Theory of Planned Behaviour' and demographics, intention and physical activity behaviour is presented graphically below in Tables 5.18, 5.19 and 5.20 respectively.

Table 5.18 PHYSICAL ACTIVITY – Association between constructs of behavioural theory (Attitudes, SN, PBC, Intention) and demographics

STATISTICALLY SIGNIFICANT **STATISTICALLY NON-SIGNIFICANT**

	DEMOGRAPHIC AND LIFESTYLE FACTORS							
PA ATTITUDES	**Age**	**Gender**	**Employ/study status**	**Level of education**	**Study subject**	**Living arrangement**	**Smoking**	**Alcohol**
Difficult/easy		Males- Easy	-Employ: easy -Unemployed: difficult			Alone - difficult		
Relaxing/stressful	Younger - relaxing	Males- relaxing		Undergraduates - less stressed		Alone - stressful	Heavy smokers- stressful	
Not enjoyable/enjoyable	Younger - enjoyable	Males- enjoyable	Students - enjoy Unemployed - not enjoyable	Undergraduates- enjoyable			Heavy smokers- not enjoyable	
Unhealthy/healthy					Health related - healthy		Fewer smokers- healthy	
PA SUBJECTIVE NORM	18-19 yrs - important	Males - important		Foundation - important	Important for Health students		Least important for non -smokers	
PA PBC		Males - confident	Employed – confident		Science –Not confident	Alone- less confident		
PA INTENTION			Students strong intention		Science - strong intention		Heavy smokers - less intention	Medium alcohol-less intention

PBC: Perceived Behavioural Control; PA: Physical Activity

Table 5.19 Physical Activity – Association between constructs of behavioural theory (Attitudes, SN, PBC) and physical activity intention

	PA INTENTION
PA ATTITUDES	
Difficult/easy	
Relaxing/ stressful	
Not enjoyable/enjoyable	
Unhealthy/healthy	
PA SUBJECTIVE NORM	
PA PBC	

Table 5.20 Relationship between constructs of behaviour theory (including Intention) and physical activity behaviours

	PA BEHAVIOUR		
PA ATTITUDES	Active exercise	TV watching	Computer/games
Difficult/easy	Active –easy	>4 hours-difficult	>4 hours -easy
Relaxing/stressful	Active -relaxing	>4hours-stressful	
Not enjoyable/enjoyable	Active -enjoyable	>4 hours-not enjoyable	
Unhealthy/healthy	Active -healthy	All thought -healthy	
PA SUBJECTIVE NORM			
PA PBC	High confidence- active	>4hours TV –less PBC	High confidence –less time on computers
PA INTENTION	Strong intention- Adequate exercise	>4hours TV - lower intention	>4hours computer - lower intention

5.4 Weight perception and its associations with self reported BMI categories and other body perceptions

Young people were asked about the perception of their body weight and 39.5% of them perceived themselves as being overweight, half of them (50.3%) thought they were normal (using the newly constructed variable – page 368) and 5.3% felt they were underweight. (Table 5.21)

Table 5.21 Weight perception among young people

Weight perception	Frequency	Percentages
Overweight	518	39.5%
Not overweight or underweight	660	50.3%
Underweight	69	5.3%
Missing	66	5.0%

The relationship between weight perception of young people and the BMI based on the self reported height and weight was assessed (Table 5.22). Among those who perceived themselves to be overweight, 42.9% were actually overweight/obese based on their self reported height and weight but 36.3% were normal and 13.7% of them were actually underweight. Conversely, of those who perceived themselves to be underweight or normal, 2.9% and 8.9% respectively were actually overweight/ obese (Table 5.22).

Table 5.22 Relationship between BMI and weight perception

	BMI based on self reported height and weight				
		Underweight	***Normal***	***Overweight or obese***	***Missing***
Weight perception	***Underweight (UW)***	41 (59.4%)	19 (27.5%)	2 (2.9%)	7 (10.1%)
	Not overweight or underweight	243 (36.8%)	315 (47.7%)	59 (8.9%)	43 (6.5%)
	Overweight (OW)	71 (13.7%)	188 (36.3%)	222 (42.9%)	37 (7.1%)
	Missing	24 (36.4%)	27 (40.9%)	5 (7.6%)	10 (15.2%)

Young people were also asked about other body perceptions such as being happy with their body, feeling fit and healthy, if they were worried about gaining weight, unhappy if they ate too much and whether or not they ate a well balanced diet. The relationships between weight

perceptions, self reported BMI and the other body perceptions were assessed and presented in Table 5.23.

Table 5.23 Relationship between weight perception, self reported BMI, and other body perceptions

a. Among those who perceived themselves as overweight/obese (n=518)

Perceived OW/obese	**BMI categories** *(Based on self reported height and weight)*			
Other body perceptions	***Underweight***	***Normal***	***Overweight/obese***	***p value†***
Happy with their body				
Yes	9 (14.1%)	26 (15.2%)	36 (17.2%)	0.782
No	55 (85.9%)	145 (84.8%)	173 (82.8%)	
Fit and healthy				
Yes	15 (23.1%)	54 (31.6%)	55 (26.7%)	0.361
No	50 (76.9%)	117 (68.4%)	151 (73.3%)	
Worried about gaining weight				
Yes	65 (95.6%)	161 (91.5%)	180 (84.9%)	0.021
No	3 (4.4%)	15 (8.5%)	32 (15.1%)	
Unhappy if they eat too much				
Yes	57 (83.8%)	135 (75.8%)	155 (72.8%)	0.181
No	11 (16.2%)	43 (24.2%)	58 (27.2%)	
Eat a well balanced diet				
Yes	26 (40.6%)	79 (45.9%)	96 (46.2%)	0.721
No	38 (59.4%)	93 (54.1%)	112 (53.8%)	

b. Among those who perceived themselves as not overweight or underweight (Normal) (n=660)

Perceived as Normal	**BMI categories** *(Based on self reported height and weight)*			
Other body perceptions	***Underweight***	***Normal***	***Overweight/obese***	***p value†***
Happy with their body				
Yes	180 (74.4%)	225 (71.7%)	37 (62.7%)	0.201
No	62 (25.6%	89 (28.3%)	22 (37.3%)	
Fit and healthy				
Yes	179 (73.7%)	217 (69.1%)	33 (55.9%)	0.028
No	64 (26.3%)	97 (30.9%)	26 (44.1%)	
Worried about gaining weight				
Yes	94 (38.7%)	177 (56.4%)	32 (54.2%)	<0.001
No	149 (61.3%)	137 (43.6%)	27 (45.8%)	
Unhappy if they eat too much				
Yes	77 (31.7%)	135 (42.9%)	20 (33.9%)	0.022
No	166 (68.3%)	180 (57.1%)	39 (66.1%)	
Eat a well balanced diet				
Yes	165 (68.2%)	209 (66.8%)	40 (69.0%)	0.912
No	77 (31.8%)	104 (33.2%)	18 (31.0%)	

c. Among those who perceived themselves as underweight (n=69)

Perceived as Underweight	**BMI categories** *(Based on self reported height and weight)*			
Other body perceptions	***Underweight***	***Normal***	***Overweight/obese***	***p value†***
Happy with their body				
Yes	13 (35.1%)	10 (58.8%)	0 (0%)	0.126#
No	24 (64.9%)	7 (41.2%)	2 (100%)	
Fit and healthy				
Yes	15 (39.5%)	10 (58.8%)	0 (0%)	0.182#
No	23 (60.5%)	7 (41.2%)	2 (100%)	
Worried about gaining weight				
Yes	4 (10.8%)	0 (0%)	0 (0%)	0.331#
No	33 (89.2%)	17 (100%)	2 (100%)	
Unhappy if they eat too much				
Yes	6 (16.2%)	2 (11.8%)	1 (50%)	0.379#
No	31 (83.8%)	15 (88.2%)	1 (50%)	
Eat a well balanced diet				
Yes	18 (47.4%)	11 (61.1%)	0 (0%)	0.224#
No	20 (52.6%)	7 (38.9%)	2 (100%)	

† Pearson Chi squared test

>20% of the cells had a expected count less than 5

Irrespective of whether the young people were underweight, normal or overweight/obese (based on self reported height and weight), those who perceived themselves as being overweight/obese were not happy with their body, did not feel fit and healthy, were unhappy if they ate too much and felt that they did not eat a well balanced diet. However, for those who perceived themselves to be overweight and were in overweight/obese BMI categories, although 85% of them were worried about gaining weight, 15% were not worried ($p=0.021$), potentially indicating a lack of perception of this health problem.

For those young people who perceived themselves as being normal (not overweight/obese), then irrespective of their BMI categories, they felt happy with their body and tended to eat a well balanced diet. Those in the normal BMI category felt fit and healthy and claimed not to be unhappy when they ate too much. However, of those who were in fact overweight then the proportion (56%) of those who felt fit and healthy was smaller ($p=0.028$). Those who perceived themselves as normal and actually were in either the normal or the overweight/obese BMI categories were more worried about gaining weight ($p<0.001$).

Those who perceived themselves to be underweight (n=69), had no significant associations between the self reported BMI categories and the other body perceptions. However, there was a trend that most of those who perceived themselves to be underweight and in fact were in the underweight BMI category were not happy with their body, did not feel fit and healthy, and tended not to eat a well balanced diet. A very small number (n=2) perceived themselves to be underweight when they were in the overweight and obese BMI category possibly showing a lack of weight perception. For those actually in the normal BMI category, the majority were happy with their body, were fit and healthy, ate a well balanced diet, were not worried about gaining weight and were not unhappy if they ate too much.

5.5 Summary

Overall, analysing the three constructs (attitudes, subjective norm and perceived behavioural control) showed that young people's attitudes towards diet (eating five a day) were more positive than towards physical activity. While they were generally positive for diet even among those who did not eat adequate amounts of fruit and vegetable, those who did not do enough exercise felt that physical activity was a difficult and stressful thing to do. However, with respect to the unhealthy/healthy attitude component, irrespective of diet or physical activity behaviours or demographic factors, there was a general acceptance that these behaviours are healthy (except for the smokers). Females had more positive attitudes towards diet whereas males were more positive about physical activity. While the relationship between the diet attitudes and age/level of education was not strong, more of the younger age group and undergraduates felt that doing adequate exercise was relaxing and enjoyable. Living arrangement was not a significant factor for the diet attitudes but those who lived alone found that doing adequate exercise was more difficult and stressful.

Young people's perception of their weight status (a surrogate measure of attitude) seems to be important in terms of their attitudes towards lifestyle irrespective of their actual BMI category. When young people perceived themselves to be overweight, then irrespective of their actual BMI categories, they felt negative about their other body perceptions. When they perceived themselves to be normal, then generally they were happy with themselves with some exceptions. Finally, if they perceived themselves to be underweight, then those in the actual UW and OW/obese categories tended to be unhappy but those in normal BMI category were on average more content.

Overall subjective norm (pleasing other people and/or meeting others expectations) was not a very important factor amongst young people for both diet and physical activity. Of those who did, for physical activity, it was important particularly for the younger age groups, males or those on undergraduate courses. From the few responses received for diet subjective

norm (17%), it was again important for undergraduates. PBC to do recommended amounts of exercise was relatively low (33%) but strongest in males, employed young people or those living with other people. Unfortunately, this construct was not measured for diet. Alcohol consumption did not have any significant association with attitudes, subjective norm, PBC for either the diet or PA behaviour. Moderate smokers were more positive towards diet while heavy smokers felt that doing exercise was stressful and/or less enjoyable.

The majority of young people had strong intentions to be physically active (64%) and to eat adequate amounts fruit and vegetables (73%). While students showed stronger intentions for doing adequate amounts of exercise, heavy smokers and medium alcohol drinkers did not. Intentions to eat enough fruit and vegetables were lower in the younger age groups, males, the unemployed and students doing foundation courses. Positive attitudes and high perceived behavioural control was associated with strong intentions to do adequate physical activity but not with subjective norm. For diet, positive attitudes and high subjective norm was important for healthy eating intention among young people, although subjective norm was not an important factor on its own.

For actual behaviour, positive attitudes and high PBC were positively related to healthy lifestyle behaviours whilst the subjective norm factors seemed to have little relationship to behaviour. Those who had the strongest intentions did tend to eat adequate fruit and vegetables and exercised regularly. However, those who did not fulfil the recommendations for both diet and physical activity behaviour still had the strong intentions to do so, again indicating that intent does not always translate to behaviour.

Chapter 6: Results - Facilitators and barriers for leading a healthy lifestyle in young people

Some young people are unable to achieve the recommended targets of healthy eating and/or moderately active lifestyle in spite of positive attitudes and intentions to do so. This chapter addresses the facilitators and barriers surrounding diet and physical activity behaviours in young people that encourage or hinder them from leading a healthy lifestyle, including preferences for the type of physical activities.

6.1 Recoding/regrouping of questions on facilitators and barriers

6.1.1 Diet facilitators (Questions 38 and 39)

Question 38 had six statements and asked the participants which of the statement would encourage them to eat more healthy food. Each statement had an option to tick (see questionnaire, Appendix 2.3, pg 339). Linking back to the Theory of Planned Behaviour, health behaviour theory that was used for the questionnaire development, two out of six statements related to health (healthy eating is good for my health and healthy eating can help prevent diseases like heart disease and cancer) and two related to appearance (healthy eating is good for my skin and it can help me keep healthy weight) and the other two related to subjective norm (what is expected of them) such as my parents/friends want me to eat healthy foods. Consequently, this question was grouped into three facilitator categories: health, appearance and subjective norm. If both statements were ticked then it was coded 'very encouraging' and coded 'not very encouraging' if it was ticked for one and not for the other. The created 'subjective norm' category was used as a construct in TPB rather than as a facilitator.

Question 39 asked participants the changes that would help them to eat more healthy food. This had eight statements each giving them three options to select, which were 'very helpful', 'helpful' and 'not very helpful'. Firstly, the eight statements were grouped into four

categories- more opportunities, more information, more support and providing choices. Secondly, very helpful and helpful from each statement were grouped together and labelled 'helpful'. This finally gave two codes 'helpful' and 'not helpful'.

Further, for categories with one statement (information and support) it was coded 'helpful' and 'not helpful'.

Categories *with two statements (opportunity) were coded:*

'Helpful' if they ticked 'helpful' to both statements

'Not helpful' if they said 'not helpful' to both statement

'Mixed' if they ticked helpful to one and not helpful to the other.

Similarly for categories *with four statements (choices), it was coded*

'Generally positive' if they ticked 'helpful' to three out of four statements

'Generally negative' if they ticked 'not helpful' to three out of four statements

'Mixed' if they ticked 'helpful' for two and 'not helpful' for two statements

It was coded as missing' if >2 statements was missing

6.1.2 Diet barriers (Question 40)

Question 40 had eight statements and asked of the participants to either tick 'yes' or 'no' for each of the statements that would prevent them eating healthy diet (see questionnaire, Appendix 2.3, pg.339). The statements were again categorised into barriers for time, access, money, problems with cooking, lack of support and don't enjoy healthy food. Further, for categories with one statement (time, access, enjoyment and money) it was coded 'Is a barrier' and 'not a barrier'.

Categories *with two statements (issues with cooking and support) were coded:*

'Is a Barrier' if they ticked 'Yes' to both statements

'Not a barrier' if they said 'no' to both statement

'Mixed' if they ticked 'yes' to one and 'no' to the other.

6.1.3 Physical activity facilitators (Question 47)

Question 47 asked the participants if they would consider doing more exercises for any of the 11 reasons that was stated in the question. Each statement had an option to tick either 'yes' or 'no'. Three of the statements related to 'health' (improve health, lose weight or maintain healthy weight, and feel fit), one related to improving appearance, three statements related to relaxing (have fun, socialise, to relax or feel better), one related to competing (to win), two were related to subjective norm (to please family/friends or to impress) and last one was 'others'. (see questionnaire, Appendix 2.3, pg.341). Apart from the subjective norm statements, the rest of them were grouped into four categories: health, appearance, relaxing/socialising and winning. Categories with one statement (appearance and winning) were coded 'important' and 'not important'.

Categories *with three statements (health, relaxing) were coded:*

'Strong facilitator' if they ticked 'yes' to all three statements

'Mostly positive' if they ticked 'yes' to two out of three statements

'Mostly negative' if they ticked 'no' to two out of three statements

'Not a facilitator' if they had ticked 'no' to all three statements

6.1.4 Physical activity barriers (Question 48)

Question 48 had 19 statements and asked of the participants to either tick 'yes' or 'no' for each of the statements that would prevent them from taking more exercise (see questionnaire, Appendix 2.3, pg.342). The statements were again grouped into 12 barrier categories: physical activity with opposite sex, competition, lack of privacy, information, company, facilities, time and money, disability, feel do enough exercise already, bad weather, choice of activities . Further, for categories with one statement (physical activity with opposite sex, competition, lack of privacy, information and money, disability, feel did enough exercise already, bad weather) it was coded 'Is a barrier' and 'not a barrier'.

Categories *with two statements (choice of activities and lack of facilities) were coded:*

'Is a Barrier' if they ticked 'Yes' to both statements

‘Not a barrier’ if they said ‘no’ to both statements

‘Mixed’ if they ticked ‘yes’ to one and ‘no’ to the other.

Categories *with three statements (lack of company and time) were coded:*

‘Strong facilitator’ if they ticked ’yes’ to all three statements

‘Mostly positive’ if they ticked ‘yes’ to two out of three statements

‘Mostly negative’ if they ticked ‘no’ to two out of three statements

‘Not a facilitator’ if they had ticked ‘no’ to all three statements

6.1.5 Physical activity preferences (Question 49)

Question 49 asked the participants the type of activity they preferred to become more physically active. It had four components: competitive sports, non competitive sports, active living and go to gym and they were asked to tick ‘yes or ‘no’ for each of the component. The original coding was retained:

1= Preferred

2= Did not prefer

6.2 Diet

6.2.1 Diet facilitators

Young people were asked about factors that would encourage them to eat more healthy food. These factors were identified from the literature and generated by the steering group. The results are presented in Table 6.1.

Table 6.1 Facilitators for healthy diet

Diet facilitator	Frequency	Percentages
Health		
Very encouraging	770	58.6%
Not very encouraging	386	29.4%
Missing	157	12%
Appearance		
Very encouraging	758	57.7%
Not very encouraging	349	26.6%
Missing	206	15.7%
Diet choices		
Very helpful	895	68.2%
Mixed	261	19.9%
Not very helpful	123	9.4%
Missing	34	2.6%
Diet opportunities		
Very helpful	909	69.2%
Mixed	222	16.9%
Not very helpful	154	11.7%
Missing	28	2.1%
Diet information		
Very helpful	916	69.8%
Not very helpful	375	28.6%
Missing	22	1.7%
Support		
Very helpful	708	53.9%
Not very helpful	571	43.5%
Missing	34	2.6%

Clearly labelled healthier choices in canteens, vending machines with more choices to choose from, more opportunities to cook and/or learn how to cook and more information on how to eat a healthy diet stand out as important facilitators for healthy eating. The understanding that healthy eating is good for health by preventing diseases like heart disease and cancer, helping to keep a healthy weight (59%) and improving physical appearance (58%) also seem to be quite important. Support from family and friends was seen as a motivator for around 54% of the young people.

6.2.2 Diet facilitators and its associations

6.2.2a Association between diet facilitators and demographic/lifestyle factors: Each of these facilitators and their association with the demographic/lifestyle factors were assessed and presented in Appendix 5.1, pg.398. To be healthy and to improve appearance came out as strong facilitators for healthy eating in females. Also seem to be encouraging, mainly amongst females, were having various diet choices, opportunities to cook, more information about eating a healthy diet and support from parents and friends. Other notable associations were: healthy choices were not important for healthy eating for the foundation level students; appearance seemed important only for undergraduate students; heavy smokers were not concerned about health and for those with a high alcohol consumption, support from family and friends was not a facilitator.

6.2.2b Association between diet facilitators and diet behaviour: Young people who thought health and appearance was important were significantly more likely to have regular meal eating patterns and tended to eat more fruit and vegetables (Table 6.2).Even so, of those who thought health was an important facilitator, half (53%) still did not eat adequate amounts of fruit and vegetables and one third (31%) had high levels of snacking. Appearance did not have any significant relationship with snacking.

While those not keen on various diet choices in canteens and vending machines tended to be low snackers, they had varied fruit and vegetable consumption as determined by '5 a day' and mixed meal eating pattern. Those who thought that information on diet was not helpful tended not to eat adequate amount of fruit and vegetables, had mixed meal eating patterns but were not necessarily snackers.

Table 6.2 Association between diet facilitators and diet behaviour

a. Fruit and vegetable consumption

	DIET BEHAVIOUR – Fruit and vegetable consumption		
DIET FACILITATORS	**Adequate fruit and vegetable**	**Not adequate fruit and vegetable**	**Significance P value†**
Health			
Very encouraging	346 (47.1%)	388 (52.9%)	0.006‡
Not very encouraging	131 (38.1%)	213 (61.9%)	
Appearance			
Very encouraging	353 (48.8%)	370 (51.2%)	<0.001‡
Not very encouraging	106 (33.2%)	213 (66.8%)	
Diet choices			
Generally positive	363 (42.9%)	483 (57.1%)	
Mixed	110 (46.2%)	128 (53.8%)	0.136
Generally negative	36 (34.6%)	68 (65.4%)	
Information on diet			
Helpful	393 (45.4%)	472 (54.6%)	0.005‡
Not helpful	121 (36.2%)	213 (63.8%)	
Opportunities			
Helpful	385 (44.9%)	473 (55.1%)	
Mixed	76 (37.4%)	127 (62.6%)	0.121
Not helpful	53 (40.2%)	79 (59.8%)	
Support			
Helpful	301 (44.8%)	371 (55.2%)	0.152‡
Not helpful	208 (40.5%)	306 (59.5%)	

† Pearson Chi-squared test unless otherwise highlighted; ‡ Continuity correction (2x2 table)

b. Meal pattern

	DIET BEHAVIOUR – Meal pattern		
DIET FACILITATORS	**Regular**	**Irregular**	**Significance P value†**
Health			
Very encouraging	482 (62.6%)	288 (37.4%)	0.014‡
Not very encouraging	212 (54.9%)	174 (45.1%)	
Appearance			
Very encouraging	475 (62.7%)	283 (37.3%)	0.003‡
Not very encouraging	185 (53.0%)	164 (47.0%)	
Diet choices			
Generally positive	523 (58.4%)	372 (41.6%)	0.572
Mixed	161 (61.7%)	100 (38.3%)	
Generally negative	70 (56.9%)	53 (43.1%)	
Information on diet			
Helpful	540 (59.0%)	376 (41.0%)	0.834‡
Not helpful	218 (58.1%)	157 (41.9%)	
Opportunities			
Helpful	531 (58.4%)	378 (41.6%)	0.268
Mixed	141 (63.5%)	81 (36.5%)	
Not helpful	86 (55.8%)	68 (44.2%)	
Support			
Helpful	421 (59.5%)	287 (40.5%)	0.629‡
Not helpful	331 (58.0%)	240 (42.0%)	

† Pearson Chi-squared test unless otherwise highlighted; ‡ Continuity correction (2x2 table)

c. Snacking

	DIET BEHAVIOUR – Snacking behaviour			
DIET FACILITATORS	**Low snacking (none to 3)**	**Medium (4 or 5 snacks)**	**High (6 or more)**	**Significance P value†**
Health				
Very encouraging	257 (35.5%)	242 (33.5%)	224 (31.0%)	0.013
Not very encouraging	133 (36.9%)	91 (25.3%)	136 (37.8%)	
Appearance				
Very encouraging	257 (35.7%)	229 (31.8%)	233 (32.4%)	0.438
Not very encouraging	112 (34.3%)	96 (29.4%)	119 (36.4%)	
Diet choices				
Generally positive	280 (33.2%)	262 (31.1%)	301 (35.7%)	0.030
Mixed	101 (41.7%)	68 (28.1%)	73 (30.2%)	
Generally negative	51 (42.9%)	38 (31.9%)	30 (25.2%)	
Information on diet				
Helpful	296 (34.5%)	255 (29.7%)	307 (35.8%)	0.076
Not helpful	136 (38.3%)	116 (32.7%)	103 (29.0%)	
Opportunities				
Helpful	298 (35.0%)	252 (29.6%)	302 (35.4%)	0.205
Mixed	85 (40.5%)	63 (30.0%)	62 (29.5%)	
Not helpful	49 (33.6%)	53 (36.5%)	44 (30.1%)	
Support				
Helpful	227 (34.2%)	202 (30.4%)	235 (35.4%)	0.283
Not helpful	206 (38.0%)	165 (30.4%)	171 (31.5%)	

† Pearson Chi-squared test

6.2.3 Diet barriers

Analysis of barriers for healthy diet (Table 6.3) indicates time as the biggest barrier (78%) to preventing young people from eating healthy food, followed by limited access to healthy food (60%) and lack of money (56%). In spite of 80% enjoying healthy food, about one third of young people did not enjoy cooking and/or did not know how to cook healthy food. Lack of support from parents and friends overall was not seen to be a barrier amongst young people.

Table 6.3 Barriers for healthy diet

Diet barrier	Frequency	Percentages
Cooking skills		
Is a barrier	168	12.8%
Mixed	315	24.0%
Not a barrier	785	59.8%
Missing	45	3.4%
Lack of support		
Is a barrier	67	5.1%
Mixed	70	5.3%
Not a barrier	1123	85.5%
Missing	53	4.0%
Time		
Is a barrier	1026	78.1%
Not a barrier	263	20.0%
Missing	24	1.8%
Enjoyment		
Don't enjoy healthy food	207	15.8%
Enjoy healthy food	1059	80.7%
Missing	47	3.6%
Access		
Is a barrier	785	59.8%
Not a barrier	490	37.3%
Missing	38	2.9%
Money		
Is a barrier	730	55.6%
Not a barrier	552	42.0%
Missing	31	2.4%

6.2.4 Diet barriers and its associations

6.2.4a Association between diet barriers and demographic/lifestyle factors: Breaking down each of the barriers to investigate their association with demographic/lifestyle factors are presented in Appendix 5.2, pg.405. Cooking skills was less of a barrier for 20-22 year olds, full time students, undergraduates and those studying health related subjects. However, nearly 20% of the heavy smokers did find cooking skill a problem. Around 12% of young people who were unemployed and/or ill and students doing foundation year courses found the lack of support from parents and friends to be a barrier for healthy eating. Time was generally an important barrier but slightly less so for the younger age groups (18-19 year olds). For time, this age trend was also observed for level of education although not significantly. Males did not enjoy healthy food as much as females and access to healthy food was a barrier to students who were also employed or for those who lived alone all the time. Lack of money was a barrier to healthy eating for those who were unemployed and/or ill, foundation level students, those studying arts related subjects and heavy smokers.

6.2.4b Association between diet barriers and diet behaviour: Young people who found cooking a barrier also did not enjoy healthy food, did not have enough money, did not eat adequate amounts of fruit and vegetables, ate irregularly or were high snackers. Those who did not have the support of family and friends tended to be high snackers, but it was not a barrier for the other two diet behaviours. People with less time tended not to eat adequate amounts of fruit and vegetables and those who did not have access to healthy food not only ate less fruit and vegetables but also snacked more (Table 6.4).

Table 6.4 Associations between diet barriers and diet behaviour

a. Fruit and vegetable consumption

	DIET BEHAVIOUR – Fruit and vegetable consumption		
DIET BARRIERS	**Adequate Fruit and vegetable**	**Not adequate fruit and vegetable**	**Significance P value†**
Cooking			
Not a barrier	354 (47.5%)	391 (52.5%)	
Mixed	98 (34.3%)	188 (65.7%)	<0.001
Is a barrier	51 (34.9%)	95 (65.1%)	
Support			
Not a barrier	451 (43.3%)	590 (56.7%)	0.257
Mixed	30 (44.8%)	37 (55.2%)	
Is a barrier	20 (32.8%)	41 (67.2%)	
Time			
Is a barrier	382 (40.0%)	573 (60.0%)	<0.001‡
Not a barrier	130 (53.9%)	111 (46.1%)	
Enjoyment			
Don't enjoy healthy food	46 (27.1%)	124 (72.9%)	<0.001‡
Enjoy healthy food	455 (45.3%)	549 (54.7%)	
Access			
No access to healthy food	296 (40.3%)	439 (59.7%)	0.017‡
Have access to healthy food	214 (47.6%)	236 (52.4%)	
Money			
Lack of money	265 (39.1%)	412 (60.9%)	0.003‡
No lack of money	245 (47.9%)	267 (52.1%)	

† Pearson Chi-squared test unless otherwise highlighted; ‡ Continuity correction(2x2 table)

b. Meal pattern

	DIET BEHAVIOUR – Meal pattern		
DIET BARRIERS	**Regular**	**Irregular**	**Significance P value†**
Cooking			
Not a barrier	495 (63.1%)	290 (36.9%)	
Mixed	168 (53.3%)	147 (46.7%)	<0.001
Is a barrier	79 (47.0%)	89 (53.0%)	
Support			
Not a barrier	667 (59.4%)	456 (40.6%)	0.155
Mixed	43 (61.4%)	27 (38.6%)	
Is a barrier	32 (47.8%)	35 (52.2%)	
Time			
Is a barrier	588 (57.3%)	438 (42.7%)	0.081‡
Not a barrier	167 (63.5%)	96 (36.5%)	
Enjoyment			
Don't enjoy healthy food	99 (47.8%)	108 (52.2%)	0.001‡
Enjoy healthy food	641 (60.5%)	418 (39.5%)	
Access			
No access to healthy food	453 (57.7%)	332 (42.3%)	0.299‡
Have access to healthy food	298 (60.8%)	192 (39.2%)	
Money			
Lack of money	407 (55.8%)	323 (44.2%)	0.021‡
No lack of money	344 (62.3%)	208 (37.7%)	

† Pearson Chi-squared test unless otherwise highlighted; ‡ Continuity correction(2x2 table)

c. Snacking

	DIET BEHAVIOUR – Snacking behaviour			
DIET BARRIERS	**Low snacking (none to 3)**	**Medium (4 or 5 snacks)**	**High (6 or more)**	**Significance P value†**
Cooking				
Not a barrier	284 (38.4%)	229 (30.9%)	227 (30.7%)	
Mixed	95 (32.5%)	88 (30.1%)	109 (37.3%)	0.005
Is a barrier	42 (26.4%)	46 (28.9%)	71 (44.7%)	
Support				
Not a barrier	392 (37.0%)	326 (30.8%)	341 (32.2%)	
Mixed	16 (24.2%)	26 (39.4%)	24 (36.4%)	<0.001
Is a barrier	13 (21.3%)	11 (18.0%)	37 (60.7%)	
Time				
Is a barrier	329 (34.3%)	300 (31.3%)	330 (34.4%)	0.276
Not a barrier	99 (39.8%)	71 (28.5%)	79 (31.7%)	
Enjoyment				
Don't enjoy healthy food	53 (27.3%)	59 (30.4%)	82 (42.3%)	0.009
Enjoy healthy food	371 (37.3%)	303 (30.5%)	321 (32.3%)	
Access				
No access to healthy food	245 (33.4%)	218 (29.7%)	270 (36.8%)	0.022
Have access to healthy food	181 (38.9%)	148 (31.8%)	136 (29.2%)	
Money				
Lack of money	216 (32.0%)	216 (32.0%)	244 (36.1%)	0.021
No lack of money	208 (39.6%)	153 (29.1%)	164 (31.2%)	

† Pearson Chi-squared test unless otherwise highlighted

6.3 Physical activity (PA)

6.3.1 Physical activity facilitators

When considering taking more exercise, 85 -90% of young people reported that improving their health and appearance and maintaining healthy weight/lose weight were strong facilitators. Doing exercise for winning/competing reasons was important for just over half of the young people (55%) but more did it for relaxation (63 %) (Table 6.5).

Table 6.5 Facilitators for physical activity (PA)

Physical activity facilitator	Frequency	Percentages
Health		
Strong facilitator	1114	84.8%
Mostly positive	163	12.4%
Mostly negative	24	1.8%
Not a facilitator	9	0.7%
Missing	3	0.2%
Appearance		
Important	1186	90.3%
Not important	120	9.1%
Missing	7	0.6%
Relaxing/socialising		
Strong facilitator	830	63.2%
Mostly positive	292	22.2%
Mostly negative	127	9.7%
Not a facilitator	35	2.7%
Missing	29	2.4%
Winning		
Important	720	54.8%
Not important	572	43.6%
Missing	21	1.6%

6.3.2 Physical activity facilitators and its associations

6.3.2a Association between physical activity facilitators and demographic/lifestyle factors: The relationships between the facilitators for doing exercise and demographic factors showed (Appendix 5.3, pg.411) that improving health and appearance were stronger facilitators for females. Health and appearance was not associated with any other factors except appearance was of least importance for those living alone from Monday to Friday. Doing exercise to relax, socialise and to make more friends was marginally more important for females, and was a strong facilitator for students studying health related subjects but less so for foundation level students and heavy smokers. Winning, competing and doing

exercises for a challenge and to improve their performance was a strong facilitator for males and the younger age group (18-19 year olds) but not for heavy smokers and arts students.

6.3.2b Association between physical activity facilitators and PA behaviour: Young people who wanted to exercise for winning competitions did tend to do adequate amounts of exercise and had less sedentary behaviour particularly with TV watching (Table 6.6). Unlike diet behaviour, appearance was not an important motivator for doing enough exercise, nor was health found to be a strong facilitator for doing a sufficient amount of physical activity. Doing physical activity to relax was not a facilitator for those who watched TV for more than four hours a day or for those who did not exercise adequately. The physical activity facilitators were not significantly associated with sedentary behaviour by being on computers/ game consoles although the trend was that those more sedentary were less inclined to do physical activity.

Table 6.6 Associations between physical activity facilitator and physical activity behaviour

a. Active exercise

	PA BEHAVIOUR – Active exercise		
PA FACILITATOR	**Adequate exercise**	**Not adequate exercise**	**Significance P value†**
Winning			
To Win	244 (34.0%)	473 (66.0%)	<0.001‡
Not to Win	122 (21.6%)	444 (78.4%)	
Appearance			
Important	329 (27.9%)	851 (72.1%)	0.182‡
Not important	40 (34.2%)	77 (65.8%)	
Health			
Not a facilitator	3 (33.3%)	6 (66.7%)	
Mostly negative	8 (33.3%)	16 (66.7%)	0.493
Mostly positive	53 (32.9%)	108 (67.1%)	
Strong facilitator	305 (27.6%)	802 (72.4%)	
To Relax			
Not a facilitator	13 (40.6%)	19 (59.4%)	
Mostly negative	25 (19.7%)	102 (80.3%)	0.044
Mostly positive	79 (27.1%)	212 (72.9%)	
Strong facilitator	246 (29.8%)	579 (70.2%)	

† Pearson Chi-squared test unless otherwise highlighted; ‡ Continuity correction(2x2 table)

b. Sedentary TV watching

	PA BEHAVIOUR – Sedentary TV watching			
PA FACILITATOR	**< half an hour**	**1 to 4 hours**	**>4 hours a day**	**Significance P value†**
Winning				
To Win	244 (33.9%)	425 (59.1%)	50 (7.0%)	0.047
Not to Win	158 (27.7%)	365 (63.9%)	48 (8.4%)	
Appearance				
Important	362 (30.6%)	734 (62.0%)	88 (7.4%)	0.179
Not important	45 (37.5%)	64 (53.3%)	11 (9.2%)	
Health				
Not a facilitator	2 (22.2%)	4 (44.4%)	3 (33.3%)	
Mostly negative	9 (37.5%)	14 (58.3%)	1 (4.2%)	0.016€
Mostly positive	61 (37.7%)	85 (52.5%)	16 (9.9%)	
Strong facilitator	336 (30.2%)	698 (62.7%)	79 (7.1%)	
To Relax				
Not a facilitator	7 (20.0%)	20 (57.1%)	8 (22.9%)	
Mostly negative	39 (31.0%)	76 (60.3%)	11 (8.7%)	0.020
Mostly positive	88 (30.1%)	178 (61.0%)	26 (8.9%)	
Strong facilitator	267 (32.2%)	509 (61.4%)	53 (6.4%)	

† Pearson Chi-squared test unless otherwise highlighted; € >20% of the cells had an expected count less than 5 in spite of the grouping. Fisher's exact test did not converge

c. Sedentary computer games/consoles

	PA BEHAVIOUR – Sedentary computer games/consoles			
PA FACILITATOR	**< half an hour**	**1 to 4 hours**	**>4 hours a day**	**Significance P value†**
Winning				
To Win	296 (41.1%)	327 (45.4%)	97 (13.5%)	0.584
Not to Win	243 (42.8%)	242 (42.6%)	83 (14.6%)	
Appearance				
Important	502 (42.5%)	514 (43.6%)	164 (13.9%)	0.333
Not important	43 (35.8%)	60 (50.0%)	17 (14.2%)	
Health				
Not a facilitator	2 (22.2%)	3 (33.3%)	4 (44.4%)	
Mostly negative	8 (34.8%)	13 (56.5%)	2 (8.7%)	0.102€
Mostly positive	61 (37.4%)	76 (46.6%)	26 (16.0%)	
Strong facilitator	476 (42.9%)	483 (43.6%)	150 (13.5%)	
To Relax				
Not a facilitator	16 (45.7%)	12 (34.3%)	7 (20.0%)	0.149
Mostly negative	48 (37.8%)	57 (44.9%)	22 (17.3%)	
Mostly positive	105 (36.3%)	141 (48.8%)	43 (14.9%)	
Strong facilitator	368 (44.4%)	355 (42.8%)	106 (12.8%)	

† Pearson Chi-squared test unless otherwise highlighted; € >20% of the cells had an expected count less than 5 in spite of the grouping. Fisher's exact test did not converge

6.3.3 Physical activity barriers

When young people were asked about the issues that prevented them from doing adequate exercise (Table 6.7), 62% of them reported that lack of time was either a strong barrier or mostly a barrier for not doing enough exercise followed by lack of money (57%), bad weather (41%) and lack of information (37%). One third of them reported a dislike for competitive activities and found the lack of company to be a barrier. A quarter felt the lack of privacy in changing rooms was a barrier to doing more exercise.

Table 6.7 Barriers for physical activity

Physical activity barrier	Frequency	Percentages
PA with opposite sex		
Is a barrier	164	12.5%
Not a barrier	1134	86.4%
Missing	15	1.1%
Competitive activities		
Is a barrier	423	32.2%
Not a barrier	874	66.6%
Missing	16	1.2%
Lack of privacy		
Is a barrier	318	24.2%
Not a barrier	979	74.6%
Missing	16	1.2%
Lack of information		
Is a barrier	480	36.6%
Not a barrier	812	61.8%
Missing	21	1.6%
Disability		
Is a barrier	61	4.6%
Not a barrier	1227	93.5%
Missing	25	1.9%
Enough exercise		
Already do exercise	221	16.8%
Do not do enough	1065	81.1%
Missing	27	2.1%
Bad weather		
Is a barrier	538	41.0%
Not a barrier	628	47.8%
Missing	147	11.2%
Lack of company		
Strong barrier	126	9.6%
Mostly a barrier	277	21.1%
Not much of a barrier	309	23.5%
Not a barrier	589	44.9%
Missing	12	0.9%
Time		
Strong barrier	237	18.1%
Mostly a barrier	582	44.3%
Not much of a barrier	278	21.2%
Not a barrier	208	15.8%
Missing	8	0.6%
Choice of activities		
Is a barrier	87	6.6%
Mixed	302	23.0%
Not a barrier	890	67.8%
Missing	34	2.6%
Lack of facilities		
Is a barrier	187	14.2%
Mixed	317	24.1%
Not a barrier	781	59.5%
Missing	28	2.1%
Lack of money		
Is a barrier	749	57.0%
Not a barrier	554	42.2%
Missing	10	0.8%

6.3.4 Physical activity barriers and its associations

6.3.4a Association between physical activity barriers and demographic/lifestyle factors: The associations between physical activity barriers and demographic/lifestyle factors are presented in Appendix 5.4, pg.416. The results show age is not associated with any of the barriers to preventing young people from doing more exercise. However, gender was associated with all of the barriers except disability. Females generally felt restricted by all barriers while males thought the fact that they felt they already did adequate exercise was the factor preventing them from doing more. Lack of information was not a barrier for students but it was for those who were ill and/or unemployed. As with diet behaviour, lack of money was a barrier for those who were unemployed and/or ill, for foundation level students, heavy smokers or heavy drinkers. Students doing health related subjects thought that lack of choice was a barrier preventing them from doing more exercise. Bad weather was not an issue for those who were employed but was for students studying health related subjects. Students who were also employed and the postgraduate students reported that lack of time was a barrier for doing more physical activity.

6.3.4b Association between physical activity barriers and PA behaviour: Young people who did not do adequate amounts of physical activity were also more likely to feel that exercising with the opposite sex was a barrier, as was privacy, money, time and lack of information and choice of activities (Table 6.8). Those who did not do enough exercise felt lack of company was a barrier and disliked participating in competitive activities. Those who were sedentary by watching TV/ computer games/consoles for more than four hours a day felt that doing exercise with opposite sex, lack of PA choices and information, lack of privacy and any disability were barriers for doing adequate physical activity.

Table 6.8 Associations between physical activity barriers and physical activity behaviour

a. Active exercise

	PA BEHAVIOUR – Active exercise		
PA BARRIER	**Adequate exercise**	**Not adequate exercise**	**Significance P value†**
Opposite sex			
Is a barrier	34 (20.9%)	129 (79.1%)	0.029‡
Not a barrier	332 (29.5%)	794 (70.5%)	
Competitive activities			
Is a barrier	92 (21.9%)	328 (78.1%)	<0.001‡
Not a barrier	273 (31.5%)	595 (68.5%)	
Privacy			
Is a barrier	72 (22.8%)	244 (77.2%)	0.016‡
Not a barrier	292 (30.0%)	680 (70.0%)	
Money			
Is a barrier	177 (23.9%)	565 (76.1%)	<0.001‡
Not a barrier	190 (34.4%)	362 (65.6%)	
Lack of information			
Is a barrier	103 (21.8%)	370 (78.2%)	<0.001‡
Not a barrier	260 (32.1%)	550 (67.9%)	
Disability			
Is a barrier	12 (20.3%)	47 (79.7%)	0.209‡
Not a barrier	351 (28.8%)	869 (71.2%)	
Already do enough exercise			
Is a barrier	130 (58.8%)	91 (41.2%)	<0.001‡
Not a barrier	234 (22.2%)	822 (77.8%)	
Lack of choices			
Is a barrier	9 (10.5%)	77 (89.5%)	
Mixed	70 (23.4%)	229 (76.6%)	<0.001
Not a barrier	282 (31.9%)	603 (68.1%)	
Lack of facilities			
Is a barrier	55 (29.9%)	129 (70.1%)	0.875
Mixed	87 (27.8%)	226 (72.2%)	
Not a barrier	220 (28.2%)	559 (71.8%)	
Bad weather			
Is a barrier	139 (26.0%)	396 (74.0%)	0.253‡
Not a barrier	182 (29.2%)	442 (70.8%)	
Lack of company			
Not a barrier	190 (32.4%)	397 (67.6%)	
Not much of barrier	85 (28.0%)	219 (72.0%)	0.008
Mostly a barrier	59 (21.4%)	217 (78.6%)	
Strong barrier	32 (25.6%)	93 (74.4%)	
Time			
Not a barrier	86 (41.5%)	121 (58.5%)	
Not much of barrier	90 (32.7%)	185 (67.3%)	<0.001
Mostly a barrier	146 (25.2%)	433 (74.8%)	
Strong barrier	46 (19.6%)	189 (80.4%)	

† Pearson Chi-squared test unless otherwise highlighted; ‡ Continuity correction (2x2 table)

b. Sedentary behaviour – TV watching

	PA BEHAVIOUR – Sedentary TV watching			
PA BARRIER	**< half an hour**	**1 to 4 hours a day**	**> 4 hours a day**	**Significance P value†**
Opposite sex				
Is a barrier	38 (23.3%)	107 (65.6%)	18 (11.0%)	0.030
Not a barrier	365 (32.2%)	687 (60.6%)	81 (7.1%)	
Competitive activities	132 (31.3%)	258 (61.1%)	32 (7.6%)	0.995
Is a barrier	271 (31.0%)	535 (61.3%)	67 (7.7%)	
Not a barrier				
Privacy				
Is a barrier	93 (29.2%)	192 (60.4%)	33 (10.4%)	0.097
Not a barrier	311 (31.8%)	600 (61.4%)	66 (6.8%)	
Money				
Is a barrier	231 (30.9%)	456 (61.0%)	61 (8.2%)	0.688
Not a barrier	174 (31.5%)	341 (61.7%)	38 (6.9%)	
Lack of information				
Is a barrier	127 (26.5%)	304 (63.3%)	49 (10.2%)	0.002
Not a barrier	273 (33.7%)	487 (60.1%)	50 (6.2%)	
Disability				
Is a barrier	22 (36.1%)	26 (42.6%)	13 (21.3%)	<0.001
Not a barrier	377 (30.8%)	762 (62.2%)	86 (7.0%)	
Already do enough exercise				
Is a barrier	78 (35.3%)	130 (58.8%)	13 (5.9%)	0.230
Not a barrier	321 (30.2%)	656 (61.7%)	86 (8.1%)	
Lack of choices				
Is a barrier	29 (33.7%)	43 (50.0%)	14 (16.3%)	
Mixed	89 (29.5%)	179 (59.3%)	34 (11.3%)	<0.001
Not a barrier	279 (31.4%)	559 (62.9%)	51 (5.7%)	
Lack of facilities				
Is a barrier	54 (28.9%)	111 (59.4%)	22 (11.8%)	
Mixed	99 (31.2%)	198 (62.5%)	20 (6.3%)	0.229
Not a barrier	245 (31.5%)	478 (61.4%)	56 (7.2%)	
Bad weather				
Is a barrier	184 (34.2%)	322 (59.9%)	32 (5.9%)	0.235
Not a barrier	197 (31.5%)	377 (60.2%)	52 (8.3%)	
Lack of company				
Not a barrier	199 (33.8%)	348 (59.2%)	41 (7.0%)	
Not much of barrier	91 (29.4%)	194 (62.8%)	24 (7.8%)	0.536
Mostly a barrier	78 (28.3%)	172 (62.3%)	26 (9.4%)	
Strong barrier	37 (29.4%)	81 (64.3%)	8 (6.3%)	
Time				
Not a barrier	62 (29.8%)	123 (59.1%)	23 (11.1%)	
Not much of barrier	82 (29.6%)	173 (62.5%)	22 (7.9%)	0.516
Mostly a barrier	185 (31.8%)	358 (61.5%)	39 (6.7%)	
Strong barrier	77 (32.6%)	144 (61.0%)	15 (6.4%)	

† Pearson Chi-squared test unless otherwise highlighted; ‡ Continuity correction (2x2 table)

c. Sedentary behaviour – Computer/game consoles

	PA BEHAVIOUR – Sedentary Computer/game consoles			
PA BARRIER	**< half an hour**	**1 to 4 hours a day**	**> 4 hours a day**	**Significance P value†**
Opposite sex				
Is a barrier	78 (47.9%)	66 (40.5%)	19 (11.7%)	0.225
Not a barrier	462 (40.9%)	506 (44.8%)	162 (14.3%)	
Competitive activities	184 (43.8%)	179 (42.6%)	57 (13.6%)	0.581
Is a barrier	355 (40.8%)	392 (45.0%)	124 (14.2%)	
Not a barrier				
Privacy				
Is a barrier	139 (44.0%)	123 (38.9%)	54 (17.1%)	0.050
Not a barrier	402 (41.2%)	447 (45.8%)	126 (12.9%)	
Money				
Is a barrier	332 (44.5%)	312 (41.8%)	102 (13.7%)	0.080
Not a barrier	212 (38.4%)	261 (47.3%)	79 (14.3%)	
Lack of information				
Is a barrier	199 (41.7%)	212 (44.4%)	66 (13.8%)	0.983
Not a barrier	340 (42.0%)	356 (44.0%)	114 (14.1%)	
Disability				
Is a barrier	24 (40.0%)	21 (35.0%)	15 (25.0%)	0.038
Not a barrier	512 (41.8%)	546 (44.6%)	166 (13.6%)	
Already do enough exercise				
Is a barrier	91 (41.2%)	97 (43.9%)	33 (14.9%)	0.924
Not a barrier	446 (42.0%)	467 (44.0%)	148 (13.9%)	
Lack of choices				
Is a barrier	37 (43.5%)	32 (37.6%)	16 (18.8%)	
Mixed	109 (36.1%)	144 (47.7%)	49 (16.2%)	0.079
Not a barrier	389 (43.8%)	385 (43.4%)	114 (12.8%)	
Lack of facilities				
Is a barrier	82 (44.3%)	78 (42.2%)	25 (13.5%)	
Mixed	129 (40.7%)	139 (43.8%)	49 (15.5%)	0.863
Not a barrier	324 (41.6%)	349 (44.9%)	105 (13.5%)	
Bad weather				
Is a barrier	198 (37.0%)	249 (46.5%)	88 (16.4%)	0.253
Not a barrier	254 (40.6%)	288 (46.0%)	84 (13.4%)	
Lack of company				
Not a barrier	255 (43.4%)	253 (43.1%)	79 (13.5%)	
Not much of barrier	126 (40.8%)	134 (43.4%)	49 (15.9%)	0.659
Mostly a barrier	107 (38.9%)	134 (48.7%)	34 (12.4%)	
Strong barrier	53 (42.4%)	53 (42.4%)	19 (15.2%)	
Time				
Not a barrier	81 (39.3%)	94 (45.6%)	31 (15.0%)	
Not much of barrier	128 (46.0%)	110 (39.6%)	40 (14.4%)	0.653
Mostly a barrier	238 (41.2%)	259 (44.8%)	81 (14.0%)	
Strong barrier	97 (40.9%)	111 (46.8%)	29 (12.2%)	

† Pearson Chi-squared test unless otherwise highlighted; ‡ Continuity correction(2x2 table)

6.3.5 Physical activity preferences among young people

Participants were asked which type of activity they would prefer if they decided to become more physically active. The results (Table 6.9) show that the majority preferred to do non-competitive sports and opted for active living.

Table 6.9 Physical activity preferences among young people

Physical activity preferences	Frequency	Percentages
Competitive sports *(football, hockey, squash etc)*		
Prefer	548	41.7%
Don't prefer	734	55.9%
Missing	31	2.4%
Non - competitive sports *(cycling, swimming, walking, yoga, dance)*		
Prefer	1156	88%
Don't prefer	136	10.4%
Missing	21	1.6%
Active living *(gardening, house work, walk to work)*		
Prefer	1114	84.8%
Don't prefer	172	13.1%
Missing	27	2.1%
Go to gym		
Prefer	899	68.5%
Don't prefer	396	30.2%
Missing	18	1.3%

6.3.5a Association between physical activity preferences and demographic/lifestyle factors: When the association between these preferences and demographics were analysed it showed (Appendix 5.5, pg.428) that 18-19 year olds, males or heavy drinkers preferred competitive sports. Older (23+) or female participants preferred non-competitive sports and active living. Students studying health related subjects or arts also seemed to prefer non-competitive sports and active living.

For both diet and physical activity behaviours, the summary of relationship between the facilitators, barriers and physical activity preferences and demographics are presented graphically in Tables 6.10, 6.11, 6.12 and 6.13 respectively.

Table 6.10 Diet and physical activity facilitators and its demographic associations

STATISTICALLY SIGNIFICANT **STATISTICALLY NON-SIGNIFICANT**

	DEMOGRAPHIC AND LIFESTYLE FACTORS							
DIET FACILITATORS	**Age**	**Gender**	**Employ/study status**	**Level of education**	**Study subject**	**Living arrangement**	**Smoking**	**Alcohol**
Health		For Females-important					Heavy smoker - not facilitator	
Appearance		For Females-important		Strong for undergraduates				
Diet choices		For Females-important		Not for Foundation				
Diet opportunities		For Females-important						
Diet information		For Females-important						
Support		For Females-important						Heavy drinkers - not facilitator
PA FACILITATORS	**Age**	**Gender**	**Employ/study status**	**Level of education**	**Study subject**	**Living arrangement**	**Smoking**	**Alcohol**
Health		For Females-important						
Appearance		For Females-important				Alone Mon-Fri-not important		
Relax/socialise		Females - marginally important		Not for Foundation	Strong facilitator - Health		Heavy smoker - not facilitator	
Winning/compete	18-19 yrs-important	For -Males important			Arts –Not a facilitator		Heavy smoker - not facilitator	

Table 6.11 Relationship between diet barriers and the demographic factors

STATISTICALLY SIGNIFICANT **STATISTICALLY NON-SIGNIFICANT**

	DEMOGRAPHIC AND LIFESTYLE FACTORS							
DIET BARRIERS	**Age**	**Gender**	**Employ/study status**	**Level of education**	**Study subject**	**Living arrangement**	**Smoking**	**Alcohol**
Cooking skills	20-22 yr olds - Not a Barrier		Student-not a barrier	Undergraduates- Not a barrier	Health –Not a barrier		Heavy smokers - Is a barrier	
Support			Unemployed- Is a barrier	Foundation – Is a barrier			Non smoker- not a barrier	
Time	18-19 yrs- not a barrier			# Increase Barrier from Foundation to PG				
Enjoyment		Males- don't enjoy		PG don't enjoy healthy food				
Access			Student & Empl- Barrier			Living alone - Barrier		
Money			Unemployed – is a barrier	Foundation –is a barrier	Arts –is a barrier		Heavy smoker – is a barrier	

Statistically non significant but trend observed

Table 6.12 Relationship between Physical activity (PA) Barriers and the demographic factors

STATISTICALLY SIGNIFICANT **STATISTICALLY NON-SIGNIFICANT**

	DEMOGRAPHIC AND LIFESTYLE FACTORS							
PA BARRIERS	**Age**	**Gender**	**Employ/study status**	**Level of education**	**Study subject**	**Living arrangement**	**Smoking**	**Alcohol**
PA with opposite sex		Females -Barrier					Heavy smokers-Barrier	
Competitive activities		Females -Barrier	Unemployed/ill-barrier		Arts -barrier			Heavy drinkers-not a barrier
Lack of privacy		Females -Barrier	Unemployed/ill-barrier		Arts -barrier	Live alone-Barrier		Heavy drinkers-not a barrier
Lack of information		Females -Barrier	Unemployed/ill-barrier				Heavy smokers-Barrier	
Disability			Unemployed/ill-barrier		Arts -barrier			
Do enough exercise		**Males Barrier**		PG think they do more exercise	Arts – not a barrier			
Bad weather		Females -Barrier	**Employed –not a problem**		Health -Barrier			
Lack of company		Females -Barrier						
Lack of time		Females -Barrier	Student & Emp-Barrier	PG-Barrier	Arts -Barrier			
Choice of activities		Females -Barrier	Unemployed/ill-barrier		Health -Barrier			
Lack of facilities		Females –Barrier						
Lack of money		Females -Barrier	Unemployed/ill-barrier	Foundation -Barrier			Heavy smokers-Barrier	Heavy drinkers-is a barrier

Table 6.13 Associations between physical activity (PA) preferences and demographic factors

STATISTICALLY SIGNIFICANT **STATISTICALLY NON-SIGNIFICANT**

	DEMOGRAPHIC AND LIFESTYLE FACTORS							
PA PREFERENCES	**Age**	**Gender**	**Employ/study status**	**Level of education**	**Study subject**	**Living arrangement**	**Smoking**	**Alcohol**
Competitive sports	18-19 yr olds -prefer	Males -prefer			Arts –don't prefer			Heavy drinkers-prefer
Non-competitive sports	Older -prefer	Females -prefer		Foundations – don't prefer	Health – prefer			
Active living		Females -prefer			Health – prefer			
Go to gym	18-19 year olds -prefer				Arts –don't prefer	Living alone -prefer		

6.4 Summary

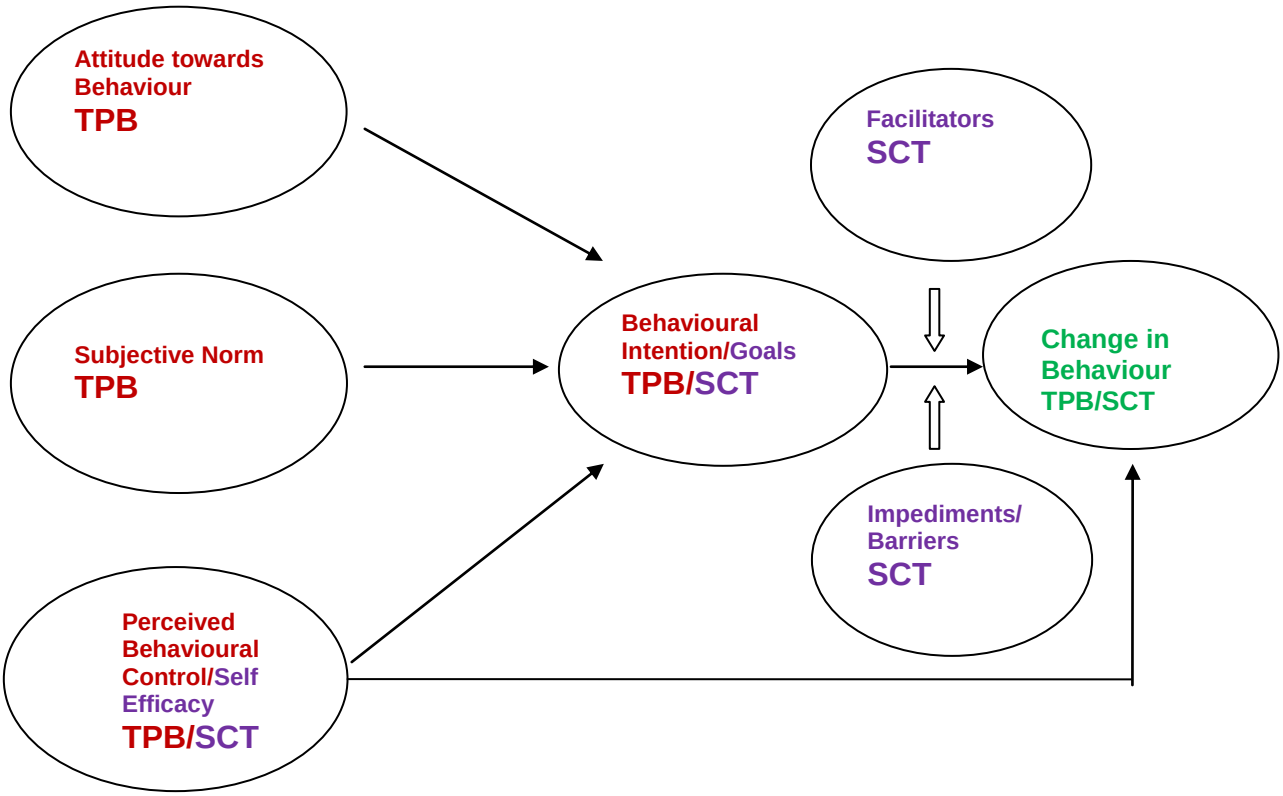
Overall improving health and physical appearance were strong motivators for both healthy eating and physical activity amongst young people while lack of time and money were major barriers. Gender differences were observed where health and appearance was more important for females while winning and competing was the biggest PA motivator for males or the younger age groups. This could explain why males and younger ones (18 -19 year olds) preferred competitive sports and going to the gym while females preferred non-competitive sports and active living. Men did not enjoy healthy food as much and thought they already did enough exercise hence preventing them from doing more exercise. However, doing physical activity to relax or socialise seems to be an important motivator for both genders.

Cooking skills was a barrier for younger age group (18 -19), probably because they were first time caterers. This seemed to improve for 20-22 year olds but became an issue in older age group (23+), postgraduate students or those employed, which might suggest lack of time with more study work load and job commitments. Money, not surprisingly, was a barrier for both eating healthy and doing adequate amounts of physical activity especially for the unemployed and/or ill, foundation level students, heavy smokers and drinkers.

Chapter 7: Summary statistical modelling - Relationship between the constructs of behavioural change theory and lifestyle behaviour and obesity

Two behavioural change theories, The Theory of Planned Behaviour (TPB) and the Social Cognitive Theory (SCT) were used to underpin the lifestyle survey questionnaire.

Figure 4.2 Theory of Planned Behaviour and Social Cognitive Theory



TPB predicts that intention is the immediate precursor of actual behaviour and that intentions in turn are influenced by attitudes, subjective norms and perceived behavioural control. One of the limitations of TPB is that it does not consider the barriers and facilitators that might play a part in the translation from a person's intention to their actual behavioural change. SCT however, does take these into consideration, allowing for a person's behaviour, personal factors and any environmental factors to constantly influence each other. By accommodating the barriers and facilitators, it was possible to develop a statistical model to assess the relationship of the relevant constructs from these theories to lifestyle behaviours and obesity.

7.1 Analysis plan for statistical modelling

Given the numerous variables found to be significant in the previous chapters, a strategic stepwise methodology was developed for the modelling. The details of the modelling were discussed with one of my supervisors (LSA) who is a medical statistician, who ran the model. The keys used for the statistical modelling are presented in Appendix 6.1, pg 432.

Stage 1: For diet, initially the relationship between each of the constructs of TPB (attitudes and subjective norm), together with demographics were modelled separately with behavioural intention (i.e. will eat more healthily). Perceived behavioural control was not measured for diet behaviour. Those found to be significant were then considered in a combined intention model. The same process was repeated for the PA intention (will do more PA) which included perceived behavioural control construct.

Stage 2: Diet behaviour (*fruit and vegetable consumption, meal pattern and snacking)* and physical activity behaviour *(actual PA, Sedentary TV, Sedentary computer games)* were separately modelled with 1) demographics 2) constructs of TPB 3) intention 4) the facilitators and 5) the barriers.

Stage 3: A combined model was then developed for each of the diet and physical activity behaviours using Forward Stepwise Logistic Regression for dichotomous outcomes or Forward Selection Nominal Regression for snacking behaviour (more than 2 groups) using only those variables found to be significant from stages 1 or 2.

7.2 Results of statistical modelling

7.2.1 Diet

7.2.1a Diet intention: Stage 1 of the modelling for diet intention is presented in Appendix 6.2, pg 433. The results show that among the demographics, age, gender and employment status were significantly associated with diet intention. While three of the components from diet attitudes, (pleasant/unpleasant, stupid/clever, healthy/unhealthy) were associated with intention, subjective norm was not. In the combined intention model, gender and employment status with pleasant and health attitudes were finally associated with diet intention (R^2 0.539).

7.2.1b Diet Behaviour: Stages 2 and 3 for each of the diet behaviours (fruit and vegetable consumption, meal eating pattern and snacking) are presented in Appendix 6.3, pg.434. For stage 2, the TPB constructs (attitudes, SN), the demographics, behavioural intention and barriers/facilitators were all modelled separately with each of the diet behaviours.

For Fruit and Vegetable consumption, from stage 2, only 'subject', 'pleasant attitude' and 'intention' were significant along with facilitators (appearance, more information on diet) and barriers (lack of time, money, inability to cook and the fact that they did not enjoy healthy food). When these were combined (R^2=0.201) in a full behaviour model (stage 3), four variables remained significant (subject, pleasant attitude, appearance and time barrier), where by those who ate sufficient amounts of fruit and vegetables tended to be studying art or health related subjects, felt that eating '5 a day' was pleasant and would enhance their appearance. Further, those not eating adequate amounts of fruit and vegetables were twice as likely to find time to be a barrier.

Regular meal eating pattern behaviour was independently associated (stage 2) with 'gender', 'employment' and 'smoking' (demographics); eating '5 a day' as worthwhile (attitude) and diet intention. Similar to fruit and vegetable consumption, 'appearance' and 'more information on diet' were important facilitators while 'lack of money', 'inability to cook' and the fact that they

'did not enjoy healthy food' were important barriers. The full behavioural model in stage 3 retained five variables indicating that men and heavy smokers were more likely to have irregular meal patterns while students were more likely to be regular meal eaters. Those who felt eating healthily was good for their appearance were also more likely to eat regularly although money was seen as a barrier (R^2 =0.111).

Nominal regression was used for modelling the snacking behaviour given the categorical response type (low, medium and high). Age, gender, year of study, subject, smoking and living arrangement were all significant demographics at stage 2 with eating healthily as being 'pleasant' as the only attitude variable, 'health' as a facilitator and 'lack of support' and 'did not enjoy healthy food' as significant barriers. In a full behavioural stage 3 model (R^2 =0.056) age, gender, smoking status, pleasant attitude, weight perception and support remained such that 18-19 year olds, men and heavy smokers, were seen to be higher snackers along with those who lacked support, those who found healthy eating to be unpleasant and those who perceived themselves to be overweight.

While 54% of the diet intentions variation was explained by demographics (gender and employment status) and positive attitudes, when diet intention was mapped on to behaviour, the model only explained 0.3% of fruit and vegetable consumption and 0.7% of meal pattern and was non-significant for snacking behaviour (Appendix 6.3, pg.434).

The summary of the full behavioural stage 3 models for all three diet behaviours is presented in Table 7.1. This model that included demographics, attitudes, subjective norms, intention, barriers and facilitators was designed to predict actual behaviour. The best of these explained only 20% of the fruit and vegetable consumption, 11% of meal pattern behaviour and only 5.6 % of snacking and diet intention was not included as a significant predictor for any of the diet behaviours.

Table 7.1 Combined diet behaviour model (Logistic Regression Model)

Diet behaviours	Attitudes	Subjective norm	PBC	Behaviour intention	Demographics	Barrier	Facilitator	Comb R^2
Fruit and vegetable	Pleasant	NS	N/A	NS	Study subject	Time	Appearance	0.201
Meal pattern	NS	NS	N/A	NS	Gender Employment smoking	Money	Appearance	0.111
Snacking	Pleasant Weight perception	NS	N/A	NS	Age Gender Smoking	Support	NS	0.056

Appearance was an important facilitator for eating adequate fruits and vegetables and eating regularly. Young people's attitude towards eating fruit and vegetable as a pleasant experience is indicated to be an important predictive factor to eat healthily (adequate fruit and vegetables and less snacking). Time, money and lack of support were important barriers.

7.2.2 Physical activity

7.2.2a Physical activity intention: The modelling for physical activity intention (Stage 1) is presented in Appendix 6.4, pg.436 Gender and employment status (demographics), attitude towards exercise as being 'easy', 'enjoyable' and 'healthy', and perceived behavioural control (PBC) were all associated with the intention to do adequate amounts of active exercise while the associated subjective norm was not. In the combined intention model all of these factors were still associated except for the attitude of physical activity being difficult (R^2 =0.553).

7.2.2b Physical activity behaviour: Stages 2 and 3 for each of the physical activity behaviours (active exercise, sedentary TV watching and sedentary computer and/or games) are presented in Appendix 6.5, pg.437.

The modelling for the active exercise behaviour (do enough vs don't do enough) (stage 2) showed that gender (the only demographic factor), attitude towards physical activity being easy, perceived behavioural control and intention (to be adequately active) were all significantly associated along with 'wanting to win' as a facilitator and 'lack of choices',

'already doing enough exercise' and 'time' as the barriers. The full behavioural active exercise model (stage 3) retained only 'PA as difficult', 'PBC' and 'already do enough exercise as barrier' as significant variables (R^2 = 0.513) showing that those who felt that they did not do enough exercise (79%) were likely to be those who found doing exercise difficult (attitude), while those who felt confident (PBC) and felt they already do enough exercise were satisfying the national physical activity guidelines.

Sedentary behaviour by watching TV (stage 2) was significantly associated with gender and employment status (demographics), attitude towards PA as being 'difficult' and 'not enjoyable', and intention but not with perceived behavioural control and subjective norm. While wanting to win was a facilitator, disability, lack of choices and bad weather were important barriers. The full behavioural stage 3 model (R^2 =0.101) retained only physical activity attitude (not enjoyable), weight perception, lack of choice and bad weather, showing watching more TV was associated with those who perceived themselves to be overweight, were neutral about enjoying physical activity or felt that there were lack of choices for physical activity.

Sedentary behaviour by being on the computers/games was significantly associated (stage 2) with gender, year of study and attitudes towards physical activity being enjoyable with health as a facilitator and disability as a barrier. Neither PBC, physical activity intention nor the subjective norm was associated with this sedentary behaviour. When these were combined in a stage 3 full behaviour model (R^2 =0.058) only two variables remained significant (gender and year of study) showing that those who were on the computer/games for more than four hours were likely to be males or postgraduates.

Similar to the diet, while demographic factors (gender and employment status) and positive attitudes explained 55% of the physical activity intention, translation of intention to behaviour was poor. Intention only explains 5.7% of the active exercise behaviour, 3.1% of sedentary

TV watching behaviour and was non-significant for sedentary behaviour by being on computes/games (Appendix 6.5, pg.437).

The summary of the full PA behavioural stage 3 models is presented in Table 7.2. For physical activity, the final models were a better fit than those for diet behaviour. Active exercise behaviour had an R^2 of 51%, while for sedentary TV watching it was 10%, although only 5.8% of time spent on computers/game consoles was finally explained. Subjective norm did not predict of any of PA behaviours while PBC only predicted active exercise but not sedentary behaviours and intention did not feature in these final models.

Table 7.2 Combined physical activity behaviour model (Logistic Regression Model)

PA behaviours	Attitudes	Subjective norm	PBC	Behaviour intention	Demographics	Barrier	Facilitator	Comb R^2
Active exercise	Difficult	NS	Good PBC	NS	NS	Enough exercise	NS	0.513
TV sedentary	Enjoyment Weight perception	NS	NS	NS	NS	Choices Bad weather	NS	0.101
Computer/ games sedentary	NS	NS	NS	NS	Gender Year of study	NS	NS	0.058

For physical activity, no facilitators were predictive of the physical activity behaviour, but bad weather and lack of choices were identified as barriers.

7.3 Final model for obesity

The final step is to try and map BMI categories to the diet and physical activity behaviours. In this final model for obesity, stage 1, each of the diet (fruit and vegetable consumption, meal pattern and snacking) and physical activity (active, sedentary TV, sedentary computer/games) behaviours, together with demographics, were modelled separately with obesity levels (BMI). These separate models showed that meal pattern (diet), active exercise and sedentary computer games (PA) with age and employment status (demographics) were significantly associated explaining 0.8%, 1.5% and 3% of the BMI variation respectively. The combined model (Stage 2) showed that only 4% of obesity level

among young people was explained by lifestyle (diet and physical activity) and demographic factors as shown in Table 7.3.

Table 7.3 Final Model – Relationship between lifestyle behaviours and obesity

Diet	Physical activity	Demographics
Fruit and vegetable Meal pattern†‡ snacking	Active exercise†‡ Sedentary TV Sedentary comp/games†	Age †‡ Gender Employment†‡ Year of study Subject Living arrangement Smoking Alcohol
Ps $R^{2=}$ 0.008	Ps $R^{2=}$ 0.015	Ps $R^{2=}$ 0.033
Combined obesity and lifestyle behaviour model Ps R^2= 0.044, n=1204		

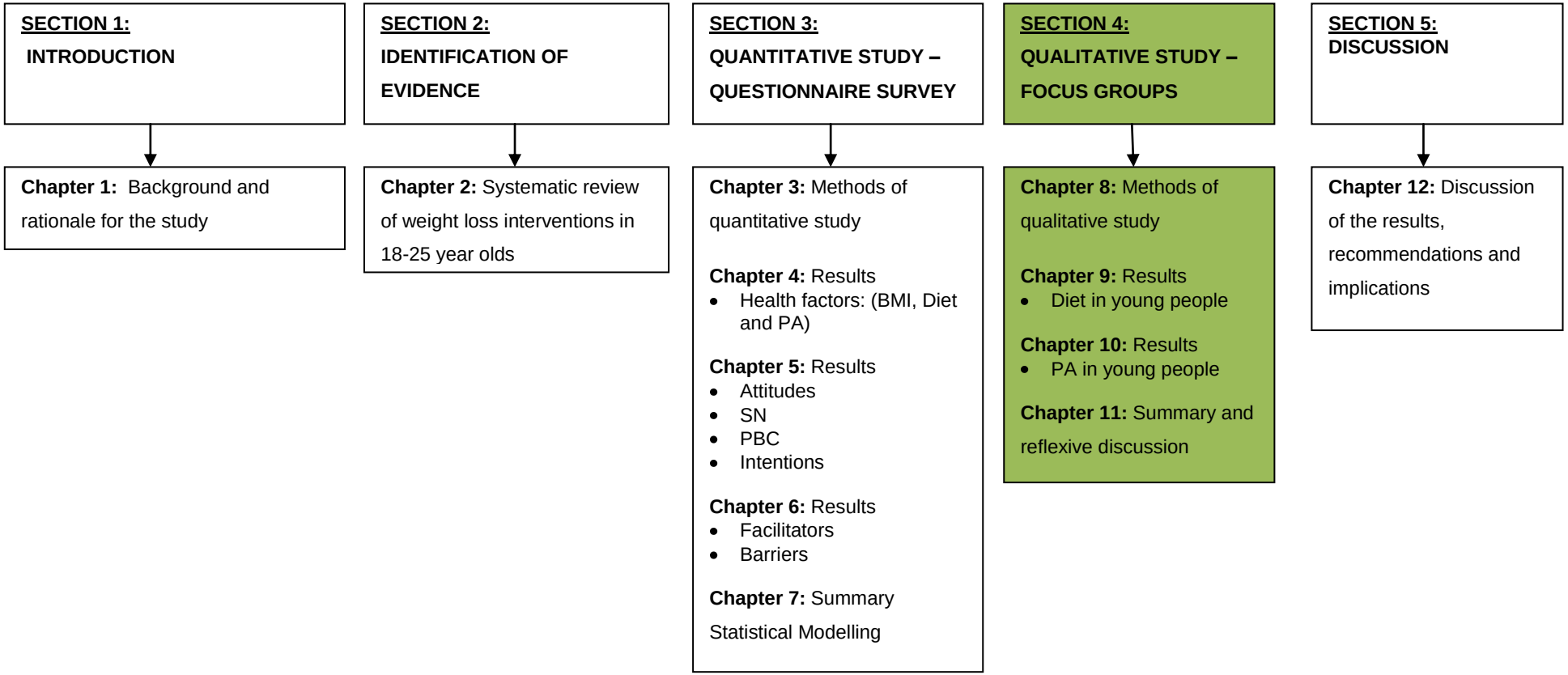
Stage 1: † Significant in each block model
Stage 2: ‡ Significant in the combined model

This indicates that age, employment, being active and regular meal patterns are significant which may be interpreted as those in the older age group (23+) were 1.6 times more likely to be overweight or obese. Young people who ate regularly and did enough exercise were 0.6 times and 0.3 times respectively less likely to be obese. Those who were unemployed and/or ill were three times more likely to be obese. However, it explains only 4%. Although many variables were seen to be associated with diet and physical activity behaviours, many fall out of the final model such as gender. Eating regular meals, regular exercising and age were the only final significant variables that explained BMI variation in this age group.

SECTION - 4

QUALITATIVE STUDY – FOCUS GROUPS

Figure 1.1 FLOWCHART OF THE STRUCTURE OF THE THESIS
PREVENTION OF OBESITY IN YOUNG PEOPLE



Chapter 8: Methods of qualitative study

The questionnaire survey presented in the previous section allowed for data collection in a standardised format to measure the constructs deemed relevant to understanding young people's lifestyles along with the strengths of the associations between these components. The constructs identified in the quantitative study were based on Theory of Planned Behaviour (attitudes, subjective norm, perceived behavioural control, behavioural intentions) including barriers and facilitators of healthy lifestyle which were included from Social Cognitive Theory. In this theory, an individual's behaviour is informed by their intentions and that behavioural intention is, in turn, influenced by attitudes towards behaviours, subjective norms and perceived behaviour control. Attitudes are determined by the belief that a desired outcome will occur if a particular behaviour is followed and the outcome will be beneficial to health. Subjective norms relate to a person's belief about what is expected of him/her (normative belief) and the person's motivation to comply with other people's wishes. Perceived Behavioural Control is a personal control over behaviour.

The results of the quantitative study identified the factors that influenced the diet and physical activity behaviour in young people and its relationship to obesity. It also highlighted the fact that intentions did not always translate into behaviour. It was understood that the quantitative study would not facilitate understanding of the context in which the questions were answered, nor explore issues in detail, both of which might have a considerable impact on the lifestyle of young people. Hence the need for qualitative research which was conducted to help understand the behaviours in their social and material context and explain the meanings that people attach to their experiences (Reed & Payton 1997;Snape D & Spencer L 2005). As the qualitative study followed the quantitative study and helped to explore the forces and influences that impact on the occurrence of a phenomenon (in this case healthy lifestyle among young people) this was deemed to be explanatory qualitative research (Ritchie J 2005). This is a *"unique tool for studying what lies behind, or underpins, a*

decision, attitude and behaviour. It also allows associations that occur in people's thinking or acting - and the meaning these have for people – to be identified" (Snape D & Spencer L 2005). Consequently, the aim of the qualitative study was to obtain an extended understanding of the experiences of young people aged 18-25 and determine further the factors that influence their lifestyle and lifestyle choices.

The objectives of this section are to:

1. Understand the lifestyle behaviours (diet and exercise) and its context among young people
2. Explore the attitudes of young people towards their lifestyle
3. Identify factors/influences that underlie their lifestyle
4. Explore the perceived barriers for leading a healthy lifestyle
5. Understand their views on motivational factors that might facilitate a healthy lifestyle
6. Identify any differences in attitudes/ lifestyle behaviour according to demographic characteristics

8.1 Method of data collection

'Focus groups' was chosen as the method of collecting the qualitative data where a group of people are brought together to discuss a topic. It is an efficient method of generating data by capitalising on the communication between participants. It gives an insight into participants' perspectives, their beliefs and behaviours, along with the meaning and reasoning behind it. This method was chosen over 'one to one in-depth interviews' in order to facilitate a comprehensive exchange of views among young people by creating a social context for discussion. In a focus group context, participants influence and/or are influenced by others as occurs in real life situations; it is ideally suited for exploring the complexities surrounding lifestyle behaviours (Rabiee F 2004). The group dynamics, which is a distinctive feature of a focus group discussion, generates rich data where participants constantly challenge each other and/or confirm each other's views (Thomas L et al. 1995). Participants are also able to respond to each other and explicitly discuss any differences that emerge during the

discussion. This interaction in itself might influence the group participants to develop particular perspectives, change their own attitudes and/or behaviour and create a group consensus (Finch H & Lewis J 2003;Kitzinger 1995;Ruff, Alexander, & McKie 2005;Walker R 1985). Participants' interaction among themselves in a focus group, takes away the interaction with the facilitator leading to greater emphasis on the participants' viewpoints (Owen 2001). Given the nature of the topic and the population of interest (18-25 year olds), it was considered that ideas would be generated in a group context that might not happen with one individual.

8.2 Sampling

In a quantitative study, the aim is to obtain a statistically representative sample so that the results or findings can be generalised to the wider population with reasonable confidence. Sample size in quantitative studies is calculated to ensure that there is enough power for appropriate statistical analysis, that the sample is ideally chosen at random to ensure that everyone has an equal chance of participating and that the chosen sample represents the overall population distribution. In a qualitative study, however, the sample is not intended to be statistically representative, but is deliberately selected because individuals have particular characteristics relevant to the issue that is explored (Mayan M 2009). Literature suggests that the sample should be diverse within the boundaries of the defined population so that the chance of identifying the full range of factors related to the issue will be optimised (Kitzinger 1995;Ritchie J, Lewis J, & Elam G 2005). For this study, a purposive or criteria sampling method was used: within the defined population of 18-25 years olds, various criteria deemed relevant for exploration were initially chosen. These criteria were influenced by the previous survey results (age, level of education, employment status) with the intention of obtaining a balanced sample in terms of socio-economic groups resulting in groups from university, college and the community.

8.3 Recruitment of the sample

An information letter (Appendix 7.1, pg.440) was developed explaining the purpose of the study, what it would involve, the topics to be covered, the details of the research team and how the data would be used. The form also explained participant anonymity and confidentiality, and that participation was voluntary. Recruitment to the focus group participation proved difficult. Due to institutional policies, students from university and colleges were not allowed to be approached directly by the researchers but had to be approached through the institution. There was also no standard system available in the public domain to approach the community groups. Consequently, information about the community groups was obtained through contacts in the health board and, in turn, through individuals responsible for running the groups.

Literature suggests that offering financial incentives to improve participants' involvement in health programmes is increasing (Finkelstein et al. 2008). While some programmes conducted in various contexts (weight loss, CVD prevention and physical activity), albeit among older adults have suggested that financial incentives are likely to increase participation in research programmes (Arterburn et al. 2008;Cahill & Perera 2008;Herman et al. 2006), some report that incentives are not a strong motivator for participation (Zullino et al. 2003). No studies were identified in young adults on increased participation using financial incentives. However, a recent trial (Henderson et al. 2010) of incentives to retain participants in a longitudinal survey cohort from ages 16 to 20 reported that offering a definite monetary award improved retention compared to *'no incentives'* or a *'chance of winning'* a reward. It was felt that an instant financial incentive might improve participation and reduce the self-selection bias from those with healthy lifestyles and hence a £10 voucher was offered to potential participants as an incentive to participate. In spite of the recruitment difficulties (outlined more fully below), seven focus groups were conducted which covered the previously defined age range (18-25 year olds) and education/socio economic status.

8.3.1 Aberdeen University

Two groups were recruited from Aberdeen University *(higher education)*. One of these university groups comprised 18-19 year old students and the other group comprised students aged over 20 years old. Permission to approach the students was obtained from the academic registrar of Aberdeen University. The information letter was sent through the institution to all students by e-mail, inviting those who were between the ages of 18 -25 years to participate in the focus groups. Responses were received by e-mail either directly or through the registry. A certain amount of homogeneity was maintained in these groups in terms of age and educational level (younger ones were undergraduates and older students, post graduates). The responses were lower from males which made the two groups heterogeneous in terms of gender but the topic of healthy lifestyle was considered to be suitable for a mixed gender discussion. In fact, diversity in some of the characteristics was considered beneficial and desirable for exploring the issues in focus groups (Finch H & Lewis J 2003).

8.3.2 Aberdeen College

Two groups were targeted from the Aberdeen College, which offers *'further education'* courses. This is a level above compulsory education, offering basic training courses to diploma level that is distinct from education offered in universities (higher education). These groups covered those in full or part-time employment who might be at college on day release courses and those in full time further education. The college approached the students directly through guidance teachers. Although there was initial interest, the turnout at the focus groups was poor and both the 'focus groups' from the college were conducted with two individuals each. It was felt that it would be unethical to cancel the focus group as the participants had given up their time to participate. The group interaction (a recognised strength of focus groups) could not be completely achieved in friendship pairs/triads. However, literature suggests that focus groups with two/three people might provide a good balance between the

group and individual context where participants feel safer without intimidation of an unfamiliar group or the intensity of an in-depth interview (Lewis J 2005).

8.3.3 Community groups

To achieve the diversity of the sample, a variety of community groups were approached by e-mail. This was undertaken in order to capture young people who were not in employment, education or training. Unfortunately, the response from these groups was not great, despite posters at flat entrances and a discussion about the project on local radio. Eventually, three small focus groups were conducted in community groups, two in Aberdeen city and one in Aberdeenshire. Two of these were preformed community groups: young mums group and a youth group, while the third group were friends. Literature suggests that using pre-existing groups allowed observations of interactions that were close to naturally occurring data. In addition, friends and colleagues can relate each other's comments to incidents that they shared and might also challenge each other on contradictions on what they profess to believe and how they actually behaved (Kitzinger 1995).

8.4 Focus group topic guide

An interview schedule/topic guide was developed to enable consistency of data collection between all the focus groups. Literature suggests that in qualitative research, a preconceived fixed theoretical position is unhelpful and emphasise the need to remain open to emergent concepts and themes (Layder D 1993). However, it is recommended that a topic guide is used as a tool to steer the discussion rather than as a strict prescription for coverage because the data emerging through interaction within the groups is a major strength of focus group discussions (Finch H & Lewis J 2003). Consequently, a topic guide covering the broader lifestyle behaviour topics such as diet, physical activity and alcohol relevant to obesity was developed. Within this structure, the constructs of behavioural theories (TPB and SCT) used to underpin the questionnaire survey were incorporated (Appendix 7.2, pg.441). A pilot focus group was conducted with masters' students at the University of Aberdeen to test the scope of the topic guide. This helped assess if the topic guide gave the participants the

full opportunity to discuss the issues and did not constrain the participants from expressing their opinions related to the research topic.

8.5 Informed consent

A consent form (Appendix 7.3, pg.442) was designed providing information on the purpose of the study, details of the research team, topics to be covered and how the data would be used. The form also explained participant anonymity and confidentiality and that participation was voluntary.

8.6 Description of the participants

Seven focus groups were conducted and the characteristics of each group are presented in Table 8.1. More females participated in the focus groups than males. The participants represented a range of educational and socio economic status. Both the university groups (Code T and C) had participants from various study disciplines (e.g. health science, biology, medicine, psychology) with a few postgraduates who did not know each other prior to the focus groups. One of the inner city group (Code H) and the shire (Code K) were preformed community groups consisting of young mothers and young people who were not in education or employment respectively. The other group from inner city (Code P) and one of the college groups (Code M) consisted of friends who knew each other quite well. All the focus groups were conducted only with the participants except the focus group with young mums, where the two leaders of the group were present. One of the leaders happened to be the mother of one of the participants. Occasionally, there was an input from the leaders, which is indicated in the results. The suggested number of participants, in the literature, for a focus group was 6-10, which deemed to be sufficient to hold an active discussion while providing opportunities for each of the participants to express their views (Massey 2011;Ruff, Alexander, & McKie 2005). Only the two university groups had the ideal recommended number for a focus group, while four out of the seven groups only had pairs or triads.

Table 8.1 Characteristics of the focus groups

Focus group	Code	Characteristics	No of participants (M/F)	Mean age (range)
Aberdeen University	T0	Older group	5 (1/4)	22 (20-24)
Aberdeen University	C0	Younger group	8 (3/5)	19 (18-19)
Aberdeen College	V0	Working/training 1	2 (0/2)	21 (20-22)
Aberdeen College	M0	Working/training 2	2 (1/1)	20 (18-21)
Aberdeen City - Torry	H0	Young mothers	3 (0/3)	23 (21-24)
Aberdeen City - Mastrick	P0	Mixture of working/not working	4 (0/4)	19 (18-21)
Aberdeenshire - Mintlaw	K0	Community Youth group- not in education or employment	2 (1/1)	19 (18-19)

8.7 Conduct of focus groups

At the start of the focus groups, the purpose of the study and the consent form was explained to participants and written consent obtained from each participant. A short questionnaire was given to participants to obtain their basic demographic information. An ideal setting proposed for focus groups is one that is neutral, which is not linked to any particular value or expected behaviour, a place that is convenient and comfortable, where participants feel relaxed and free to share their ideas and opinions without being intimidated (Ruff, Alexander, & McKie 2005). Consequently, focus groups among the university/college students, who were not familiar with each other, were conducted on university/college premise. However, the focus groups among the preformed community groups were conducted in their own familiar environment so as not to be too disruptive of their routine. The focus groups were directed along the constructs of the theories for each of the topics but were open to wider discussion to allow for unanticipated themes and hence were not too prescriptive.

Questions about behaviour were asked initially before motivational and attitudinal factors as suggested by the literature (Ritchie J, Lewis J, & Elam G 2005). Attempts were made to include everyone in the discussion and to balance the contributions by participants in order to avoid dominance by one or two people in the group. The possible influence of the presence of the leaders during one of the focus groups (one leader was also the mother of a

participant) was acknowledged. Consequently, attempts were made politely to curtail any dominance by the leaders. Group interaction was encouraged throughout to keep the discussion open and to obtain a wider response from participants. Occasionally, the group was steered back to focus when the discussion seemed to have moved away from the relevant area (e.g. ex-boyfriend, friend being stalked at work). In the groups that had less than four participants, the limitation of losing some of the qualities of being in a group was acknowledged and attempts were made to stimulate the discussion further as suggested in the literature (Finch H & Lewis J 2003). This was done by putting across different points of view raised by other previous focus groups that had more participants and also points that might have been generated within a bigger group.

Two researchers were present during all focus groups, one being the facilitator and the other observing, making field notes and prompting if necessary. All focus groups were recorded and transcribed as soon as possible after the focus groups to ensure an accurate a transcription as possible. Accuracy of transcribing was also checked by the other researcher by listening to the recording again.

8.8 Analysis of focus groups

This study was a mixed method explanatory design comprising two phases starting with collection and analysis of quantitative data, followed by collection of qualitative data. The second qualitative phase was designed so that it followed on from or connected to the results of the first quantitative phase. The purpose of this design is that the qualitative data should help explain or build on the initial quantitative results (Creswell JW & Clark VP 2007).

The initial quantitative study was based on the constructs of an existing behavioural change theory and the focus group topic guide for the qualitative study followed the same pattern. As the study was founded on theoretical constructs, ‘Framework analysis’ was considered the most suitable method to analyse the qualitative data. ‘Framework analysis’ method was developed in the 1980s at the National Centre for Social Research (Krueger RA 1994;Ritchie

J & Spencer L 1994): it is a matrix based method for ordering and synthesising data. The 'Thematic Framework' is the central component of this method. Based on the framework, the data is organised according to key themes, concepts and emergent categories (Ritchie J & Lewis J 2005). The advantage of this method is that it includes not only the *a priori* hypothesised themes but also allows flexibility to incorporate any other themes that emerge from the data, both from questions asked and also the experiences and narratives of the participants (Rabiee F 2004). It is considered to be a systematic approach which allows transparent data management and comparison of data between groups and was deemed to be the most appropriate method to analyse the focus groups for this study.

8.9 Framework Analysis

There are five main stages in Framework Analysis (Pope, Ziebland, & Mays 2000;Ritchie J & Lewis J 2005). They are:

1. Familiarisation of the contents of the raw data
2. Identification of a thematic framework to address the aims and objectives of the research while open to the contents of the data so that the analysis can also be inductive
3. Indexing/coding of the data
4. Charting of the data within each theme
5. Mapping and interpretation

8.9.1 Familiarisation of the data

All the transcripts were read several times to familiarise with the data and to obtain a thorough understanding of the contents of the data. Broad observations were made at this stage.

8.9.2 Identifying a thematic framework

For the second stage, concepts or themes related to the behavioural theories constructs used (e.g. attitudes, behaviour, motivators) and other concepts within the data that did not fit into any of the theory constructs but were relevant to the research question, were identified (Appendix 7.4, pg.443).

8.9.3 Indexing/coding of the data

Drawing across the different focus groups, the recurrent themes and other issues that emerged from the focus group discussions were identified, potential 'categories' created along with a coding system: these were knowledge, attitudes, behaviour, influences on the behaviour, motivators, barriers, intentions, subjective norm, perceived behavioural control and other comments (Appendix 7.5, pg 444.). The transcripts were then returned to and the relevant sections were highlighted and colour coded according to these categories (Appendix 7.6, pg.445). A sample of transcripts was independently coded by one of the supervisors (AEC) and themes identified, which were then discussed regularly until a framework was agreed.

8.9.4 Charting of the data

Once the coding was complete, relevant sections from the transcripts were charted in separate excel work sheets using the actual words used by the participants. Initially, one separate excel sheet was used for each broad theme/construct from the behavioural theory. In addition, keeping the inductive nature of the qualitative research, the emerging themes and concepts that did not fit into any of the theoretical constructs were initially grouped as

'other themes'. Consequently initial charting was for: attitudes, behaviour, influences on behaviour, motivators, barriers, intentions, subjective norm, perceived behavioural control, knowledge and other themes. An example of this is presented in Appendix 7.7, pg 446. This gave an opportunity to assign same sections of the transcripts to multiple locations which had relevance to two or more themes lest fragmenting the passage might lose its context and meaning. The focus group data was approached as 'participant based group analysis' where the contributions of the individuals were separately charted and analysed in the context of the whole group discussion. This helped to retain the information provided by each participant and to follow the interaction among the participants within the context.

Then, the original data within and across the themes for each age group was read systematically to consider the meaning and was summarised allowing for the identification of sub themes emerging from within each broader theme (Appendix 7.8, pg.447). This reduced the amount of data to a more manageable level so that related sub themes could be grouped together. The initial charting of the original data was revisited constantly while summarising the data. As a final stage of data management, the summarised data was charted in a matrix. Each focus group was allocated a column and each row denoted a theme for the summarised data. This whole process was conducted for both diet and physical activity separately as lifestyle behaviours relating to obesity (Appendix 7.9 and Appendix 7.10, pgs 455 and 456).

8.9.5 Mapping and interpretation

As a descriptive account, for each of the lifestyle behaviours, summarised data in each row (theme) was read again to understand the range of data that existed and also to map various elements/categories relating to each life style behaviour. Further from the descriptive categories, the data was looked at in detail to see if there were any linkages between the sets of phenomenon. Attention was paid to see if there were linkages across two or more phenomena of the same kind (two sets of attitudes i.e. attitude towards diet and attitudes towards physical activity), phenomenon of different kind (attitudes and intentions) or if

multiple associations co-existed. This was done by looking at the data across the different phenomena and across the different sub groups of the populations as determined by the original sampling criteria. Data was explored for emerging patterns that might explain each lifestyle behaviour amongst young people.

The results of the qualitative study will be reported for the different lifestyle behaviours in the next two chapters.

Chapter 9: Results - Diet in young people

The results from seven focus group discussions on diet, conducted among young people from different educational and socio economic backgrounds, are presented in this chapter. The characteristics of the focus groups (Table 8.1) is repeated again in this chapter as a reminder of the 'codes' for the easy understanding of the interaction of the participants from various groups. The quotes that are presented in the next two chapters were chosen to indicate the subthemes that emerged, to give a reasonable representation across different groups/participants and to highlight the interaction that occurred within a focus group.

Table 8.1 (repeated) Characteristics of the focus groups

Focus group	Code	Characteristics	No of participants (M/F)	Mean age (range)
Aberdeen University	***T0***	Older group	5 (1/4)	22 (20-24)
Aberdeen University	***C0***	Younger group	8 (3/5)	19 (18-19)
Aberdeen College	***V0***	Working/training 1	2 (0/2)	21 (20-22)
Aberdeen College	***M0***	Working/training 2	2 (1/1)	20 (18-21)
Aberdeen City – Torry	***H0***	Young mothers	3 (0/3)	23 (21-24)
Aberdeen City – Mastrick	***P0***	Mixture of working/not working	4 (0/4)	19 (18-21)
Aberdeenshire - Mintlaw	***K0***	Community Youth group- not in education or employment	2 (1/1)	19 (18-19)

Five main themes emerged during the focus group discussions on diet. They were: diet behaviour, influences on diet behaviour, knowledge and sources of the knowledge, attitudes and behaviour change. Within each of these themes, several subthemes were identified as presented in the Table 8.2 and discussed below.

Table 8.2 Diet of young people: themes and sub themes

Themes	Subthemes
1. Diet behaviour	• *Actual behaviour* • *Eating in phases* • *Need variety of food*
2. Influences on diet behaviour	• *Positive influences* *Mothers/partners* *Living independently* *Encouragement from society* *Reasons for eating healthy e.g. feel better, more energy* • *Negative influences* *Mothers/partners* *Childhood experiences* *Lack of planning and organising* *Access to healthy food* *Fussy eating* *Lack of facilities* *Cultural factors* *Reasons for eating unhealthy e.g. stress, quick energy* • *Subjective norm (expectations and pleasing others)* • *Assumptions* • *Values* • *Mood*
3. Knowledge and sources of information	• *Knowledge about diet* • *Influencing others*
4. Attitudes	• *Attitudes towards cooking* • *Attitudes towards diet* • *Lack of concern (living for now)* • *Attitudes towards others behaviour* • *Attitudes towards healthy eating messages*
5. Behaviour change	• *Reasons for changing past behaviour* • *Intention and PBC* • *Motivators to change behaviour*

9.1 Diet behaviour

9.1.1 Actual behaviour

Young people had a wide range of eating behaviour. Those who were older (20+ age group), irrespective of being at university or college, thought and were reasonably confident that their diet was generally healthy:

T03: "Yeah I think in general I have a healthy diet."

V01: "I'd say more healthy than unhealthy."

The 18-19 year olds, however, who were studying at college or university, were less confident about their diet. Some thought it was relatively healthy but some felt it was unhealthy with irregular eating and skipping of meals along with too much snacking and fizzy drinks. They felt they ate better before coming to university:

C01: "My diet is awful. I eat like three bars of chocolate a day. I always, I always snack now. I never used to snack at all."

C04: "Just have like 2 snacks throughout the day rather than having a lunch."

C03: "Was eating a bit healthier before coming to university. I think its cause my mum was cooking."

Among young people who were not in education (working or not working) and young mothers who stayed at home to look after their children, most felt their diet was very unhealthy. While the young mums felt that they did not have a chance to get a proper meal after looking after their children, those who were working had irregular meals which were often unhealthy takeaways most of the time, with heavy snacking between meals. The diet of both groups rarely contained any fruits or vegetables:

P03: "I snack in between meals so you're not always hungry."

H03: "I hardly ever. But then I just pick at stuff later on and that. I hardly ever get a proper...."

H03: "No, hardly ever (eat veg), unless I make soup and stuff like that."

H02: ''Wrong thing...I never ever.. eat my vegetables (sighs) Dinna.. just don't eat them."

P04: "…eat..3 in the morning... chips, cheese, gravy, mayonnaise and tomato sauce."

9.1.2 Eating in phases

All the groups admitted to going through phases of healthy eating which came across quite strongly. For the university and college students, the unhealthy phase started when they moved away from home and started to live independently. In spite of the initial unhealthy phase, participants made a decision eventually to be relatively healthy (highlighted later under 'reasons for changing unhealthy behaviour') but did have occasional lapses which were mainly during times of stress with exams and essay writing:

> *M02: "I moved away from home and I don't really have time to prepare any meals. Just eat outside. But it was never too long. May be a week or two. And I felt like really badly. Not mentally, just physically. So I just have to change it."*
>
> *T02: "Sometimes you eat kind of unhealthy stuff for energy because I've got an essay, and suddenly the diet goes out the window and it's Irn Bru and crisps and chocolate."*
>
> *V01: "I go through phases of eating healthy then pigging out, sort of thing."*

For some of the participants, however, healthy/unhealthy phases were very frequent. For some the healthy phases did not last for very long. There were many factors that contributed to these lapses. Sometimes it was a spur of a moment decision to have a takeaway because they '*just fancied it*' and sometimes they simply said they '*couldn't be bothered*' to prepare healthy food.

> *V01: "…well sometimes you just fancy a Takeaway."*
>
> *P02: "I just go through a phase that I want a salad for some strange reason."*
>
> *H01: "…like I just eat healthy for a day or two. Just like eat fruit and dinna eat Takeaways and don't drink fizzy juice. Two days I'll last and I'll go back."*

9.1.3 Need for a change

Participants expressed a need to change their diet frequently because it was '*boring*' to always eat the same thing regardless of, whether it was healthy or unhealthy food:

> *P02: "I went through a phase of Chinese chicken baguettes for three weeks non-stop. Getting bored of this. Then I changed to lentil soup. Got bored of that. Then I changed to the salad. But then I would take turns and have one each every so often."*
>
> *C02: "Nobody's going to want to eat spaghetti every night just because it is healthy."*

K02: "I couldn't eat the same thing...lot of folk that eat healthy .... only baguette... I couldn't eat one thing."

P03: "I was getting bored of living on pizza."

9.2 Influences on diet behaviour

There were many factors, positive and negative, that influenced the diet behaviour in young people.

9.2.1 Positive influences

***Mothers/partners*:** Childhood experiences and participant's mothers had a major positive influence on university and college students in terms of how they viewed food and their actual diet behaviour. Even when they had a spell of unhealthy eating, these participants were able to return to a healthy diet because of what they were used to in their childhood:

T01: "If someone said make a really unhealthy meal I wouldn't really know what to make. Cause it's just not what I eat. It's not what my mum makes."

T02: "Cause I was going to put on a lot of weight if I carried on....so I made a conscious effort to kind of change. But it was something I felt more comfortable with because it's what I used to eat at home."

Even during stressful times, such as exams, some students had relatively healthy diets because of the influence of their mothers. They felt it was '*in-bred*' and even if they were diverted for a while, they would change back to having a healthy diet:

R03: "I think even during exams and stressful times, ...In general my meals are still the same or more healthy. Also because I just try and think well the healthy thing is probably the right thing to do especially during those times. That's what my mum always told me and the kind of thing that sticks I think."

M01: "It was just bred in. I was sometimes allowed to have chocolate or something, And then just, now I don't like it."

For one participant, her partner's support was a positive influence on her diet.

H01: "When I was eating healthy my boyfriend did it as well so it was easier for me".

Living independently: Some participants in university/college group, felt that they ate healthily before coming to university (as highlighted in the section above). However, being

exposed to healthy food by friends when they first lived independently, had a positive influence on their diet behaviour.

> *T03: "That basically started when I went backpacking for a year. I used to live with a girl who was really into healthy living. And that's basically when it started."*

Some young people, who were at college but still living at home, were anxious that their diet might become a bit unhealthier, if they were to live independently. The reasons were that they might not have time, not be able to afford to buy healthy food, or would be too lazy to cook for themselves. However, they were reasonably confident that they would eat healthily although their diet might not be that varied:

> *M01: "(If I live on my own)Yeah...probably would be still healthier. But it probably wouldn't be as healthy you know. Probably would be almost same things every day maybe. Probably pasta a lot of the time. Not as varied."*

Encouragement from society: University and college students felt that students should be given opportunities to set up cafes, to provide healthy and affordable food on the campus. They felt a strong need for cheaper health cafes that sold healthier food which they said would have a positive influence on the way they ate:

> *T04: "I think if we were to have a space on the university campus where we could cook our food."*
>
> *T01: "Maybe some sort of common space like the equivalent of staff tearooms but for students that have like microwaves and stuff....and students could organise themselves."*
>
> *C03: "I think the healthy cafes and stuff, they need to be cheaper."*
>
> *M02: "I think the canteen would be much better if be kind of "milky bar". In Poland .... some soup, some.... Well everything can make with milk, eggs..yeah its, one thing it's healthy and students enjoy it. It's usually not so expensive to make so usually doesn't cost too much."*

Reasons for healthy eating: In young people who had been exposed to a healthy diet and had at least tried to be healthy for a while, the reasons given for healthy eating were to *feel better, look better* and to get into good habits. Those who were studying felt that it *improved their concentration*, gave them more energy and helped them perform better. A healthy diet was also felt to be more satisfying and prevented the need to snack:

> *V02: "OK, well may be my nails will look better now or my skin won't be as clogged up. Or I won't put on as much weight if I eat lower calorie food."*

C06: "Get a good meal and you feel more satisfied and you probably won't go back and snack."

A less recurrent view reported by a university student was about performing better at sports:

T05: "(eating healthily) Mostly for health and then well probably looks as well. Because I'm also into sports so if I don't eat healthy I'll get worse, ...So its mostly for performance and being healthy."

Some participants were concerned about *putting on weight* and wanted to *avoid ill-health* later in life. For those who ate healthily, unhealthy food made them feel 'sluggish', 'greasy', 'dirty' and 'icky':

T02: "I think its just generally better for you. It makes you feel better. I know that if I eat, if I eat an unhealthy meal you kind of feel greasy and horrible."

Health scares in the past (anaemia) were also given as a reason to eat healthily:

K01: "No (do not eat vegetables)..but I have to eat it ..because I am anaemic so.."

9.2.2 Negative influences

Mothers/partners: While some of the young people at university and colleges were positively influenced by their mothers (highlighted in previous section), young people from the inner city did not experience having such a relationship with their mothers/parents:

P01: "I don't think I've seen my mum cook for 18 years. my mum just says "get out".... you're fussy, get out."

P02: "They cook for themselves...my mum cooks me something separately ... They'll have fish. She's got to cook me something completely different...I hate fish.... my mum just tells me I'm fussy."

P04: "Every night my ma has beans with her supper but she doesn't eat them."

They were uncomfortable talking to their parents about their concerns such as inability to cook. Some did not eat what their mother's cooked:

K01: "No...Don't talk stuff like that."

P02: "Refuse to eat it... cause I won't eat what they're eating."

While partners had a positive influence (see above), lack of support had a negative influence on the diet of some participants:

P03: "I enjoyed it (eating healthy...not pizza). I don't think he enjoyed it. So, he (partner) changed. And I was like well there's no point in me doing it if you're not willing to cope with it as well. So I gave up."

Childhood experiences: While participants from university and colleges were exposed to eating fruits and vegetables from early on in life, some participants from the inner city had no

experience of eating a healthy diet as children or they ate fruit/vegetables very rarely. Some ate fruit and vegetables only if there was nothing else to eat in the house and if it was prepared and handed to them. Those who cooked for themselves never shopped for fruit and vegetables and never cooked vegetables:

H03: "...dinna ken cause I don't really eat healthy."

P04: ".Aye she buys it (fruit and vegetables) all the time but I'll only eat it because my ma's got nothing else to eat in the house."

P02: "If its in the house and I like it I'll eat it."

K02: "I probably would eat them (if given to them)."

A participant from inner city reported that a grandparent was a negative influence:

P01: "I tried to follow my granda's footpath. My grandda's allergic to all fruit for some reason. I was a right grandda's girl, thought I'd be a copycat."

Planning and organising: One of the strongest subthemes that came across in all the groups as a negative influence was the lack of planning and organising. Not being organised to make their lunches on a day- to-day basis or planning their meals and shopping during stressful times (exams/ long working hours) made them choose the easy option of eating out, skipping meals and snacking:

T02: "It's sometimes planning. you've got to soak chick peas over night. You've got to remember to do that the day before. But if I've got an essay my mind is not on chick peas it's on whatever I'm writing an essay on... it's just it takes priority."

C02: "I never get time to make myself lunch or something. ....so I end up eating so much in between meals and stuff."

V02: "But it's like, if I don't prepare lunch and we're like what are we going to do for lunch today, just go to the bakers or something. That's where it all goes wrong really."

Amongst university students, while some felt cooking took up a lot of time which they would rather spend studying, it was contradicted by others who felt that it relaxed them and that it took the same time to cook a healthy meal or an unhealthy option:

T03: "I find it quite relaxing just to take a break from studying. Take maybe half an hour to cook and half an hour just to eat it. And then I'll feel like, now I've had my break and now I've got the energy to keep going again."

T03: "I feel cooking a simple but decent meal takes about as long as putting a pizza in the oven and wait for it to, finish, to cook itself really."

Among those who worked, working long hours with no time in between influenced their unhealthy diet:

P04: "It was hard working from 7 in the morning till 10 at night. And only getting a fag every so often."

K01 and K02: "Weekends …Sleeping..It is my sleep time then"; k02: "It is my drinking time."

Access to healthy food: Close vicinity/easy access to fast foods and the lack of availability of healthy food was another negative influence on healthy eating:

C02: "I was just going to say that it's easier as well (eating outside). If you go out you don't have to cook anything. You can just walk in and buy the stuff. You just stand there waiting for it to come to you. You don't have to like watch the oven and make sure you're cooking it right, or like time everything and stuff. It's a lot easier."

P01: "Asda's far too far from my house. It's like no. Lazy. Nearest shop to my house is either a Chinese or Spar.... from my house its an hour and ten minutes. So its like, no. Trail. Obviously its two buses. Right across the road from me, and I got them to home deliver to me yesterday. Across the road from me, literally you can just see it as soon as you go out."

C03: "There used to be like a bigger shelf for them (fresh fruit and vegetables) and they always used to have fresh apples and bananas. But now it's a tiny little shelf that you can hardly see. .... If you are wanting a snack they don't have any fruit."

Fussy with food preference: Participants from the inner city did not eat very much fruit and vegetable because they said they were 'very fussy' about which foods or fruits/vegetables they ate:

P02: "See I used to buy fruit salads from there as well. It was good... cause it was melon."

P01: "I'm not a vegetarian but I don't like ham or meat or bacon."

P0: "I don't eat fruit...apart from grapes, that's about it. I don't like anything else….I like veg."

Lack of facilities: Students who were living in the halls of residence felt that the lack of facilities played a part in their diet behaviour. They said that there were no kitchen facilities available to cook a decent meal and uncleanliness when sharing the accommodation with other students also played a part:

C05: "I think it is hard to like make stuff as well. I live in catered halls and the food is disgusting. But it is really hard to like make other things. There's like one little hob thing and you have to share that between like 30 people."

C06: "It's clean one day and just a mess the next. That limits what you can do."

Cultural factors: Two students who participated in the focus groups were from different countries (Poland and Sweden). They felt that food in Britain was generally unhealthy and found it hard to buy non fatty food and good bread:

C01: "In Sweden we eat so much healthy. I don't know what you do here but the food here is very unhealthy. Especially I live in halls. The food is really fat."

M02: "Maybe its because of the breads. I'm not really used to these kind of bread you have in Scotland. Because I'm from Poland we have different kinds of breads. Much more enjoy the bread which is in Poland than here."

Reasons for unhealthy eating: The other main reason given by participants for eating unhealthily were *day-to-day stresses,* in terms of studying for exams, long working hours, looking after young children or having little time or the lack of ability to plan meals. Participants said that they could not take time off from work and their studies to cook:

T02: "I eat healthy when I've got nothing on. But the minute I've got something stressful (essay) coming up the diet goes out the window."

H01: "I can't do nothing else (cook) but see to the kids. So it is hard just to try and cook something and get..."

There was a contradiction among young people about the 'energy' that different types of food gave them. While some participants were aware that healthy foods could keep them going for longer (see section on positive influences), some of the participants felt snacks like crisps and muffins were *more appetising* and gave them instant energy and sustained them for longer rather than healthy foods:

T04: "It gives you that burst of energy quickly. Bananas do that too but um. Yeah I just ...yes exactly, tired of bananas more quickly than you get tired of chocolate.."

T02: "Sort of eat chocolate, buy something unhealthy, or a muffin or something. Just kind of keep me going through the day."

V01: "I think that a packet of crisps fills me up more than apple does."

The majority of participants across all the groups felt that healthy food was *very expensive*; however, some also recognised that unhealthy products were as expensive and for some,

price was not a problem. They expressed a preference for unhealthy food because it was easily available and that vegetables deteriorated quickly:

T03: "If you go to "The Hub" at uni, and you want to buy an apple, probably a single apple is more expensive than a chocolate bar, I guess. That's just the wrong way round."

C02: "Its actually a lot cheaper just to eat unhealthy. My main problem is keeping enough money to do stuff. So I just eat unhealthy and it saves me money."

H03: "Its more expensive buying Irn Bru and sweeties ....aye but they're there for the kids anyway."

C03: "I have to use up all the vegetables really quickly. And I can't afford to then go back into town and do more shopping to get more vegetables. So I just end up having like pizza and chips and stuff."

Other reasons given for eating unhealthily were the *lack of company:*

C08: "It tends to be depressing when you just cook for yourself. My friends are not around and I have to eat alone."

M01: "I don't enjoy eating a big meal by yourself. If I was with other students who enjoyed cooking a meal and eating it that would be fun but I wouldn't spend ages making something just for me..because you cook for ages and then you sit and eat it."

9.2.3 Assumptions

The participants had several assumptions that influenced their diet. There was a notion that eating *'vegetarian/organic food'* and only those made from fresh ingredients was inherently healthy, while eating products not grown locally/ non-organic/ tinned food /ready meals was unhealthy:

T01: "When you eat vegetarian and you eat vegetables every day its kind of hard not to be healthy."

M01: "All food is organic which is quite healthy I think. And then a lot of vegetables and fruit."

T03: "And still they just prefer canned soup. They heat that, cause that's what they do as well."

T02: "if you are on a diet you know, don't eat ready meals, eat some pasta or sauce or something. But, she's (flat mate) not the most healthy person."

Participants ate 'vegetarian' because vegetables were cheaper than meat; however, there was recognition that those products that substitute meat were also expensive:

T01: "Vegetarian definitely is cheaper."

T03: "Meat replacing products quite often aren't cheap either."

It was felt that it was all right to have an occasional unhealthy diet, if in general, they had a reasonably healthy diet:

> *T01: "Well it depends I think what you think is healthy like, I'll have cereal for breakfast then everyday at lunch I'll make a sandwich but, you know, I put quite a lot of mayonnaise on it, so some people might say that's really unhealthy. I'm like, well if I've got salad on it I think it's fine to have mayonnaise. And then the same I'll maybe have crisps or chocolate most days because my dinner is very healthy. So I think that's a healthy diet."*
>
> *T04: "I don't eat wheat products and I don't eat dairy products. So I eat a lot of vegetables as well. I try to eat organic vegetables as well. And unfortunately I really like chocolate, especially since I stopped eating wheat and dairy products. I don't mind. I think that's ok to my diet to eat heaps of chocolate."*
>
> *M02: "if I just want to buy crisps I buy it but I don't as much as others. I don't eat every day. I think I am still healthy. Could be better but it's not that bad."*

There was also an assumption by the participants in one of the inner city groups, that as long as they did enough exercise, diet did not matter and having a 'smoothie' was considered part of 'five a day':

> *P02: "Not concerned about diet..no.. as long as you exercise..... enough stairs in Primark…….you burn your dinner off by the time you get down stairs"*
>
> *P02: "I dinna..I take smoothies. Does that work"*

9.2.4 Values

One person from the university had a strong opinion about eating vegetarian food. This participant did so because good quality meat was not affordable, felt that this supported the right industry (by buying local produce) and was also influenced by the subject studied at university (conservation biology):

> *T01: "I try and eat locally and in season, so."*
>
> *T01: "I tend to eat vegetarian because I can't afford decent meat and I don't like the idea of eating cheap rubbish meat. I think my beliefs as well, if its been treated that badly what's it going to do to me would be my thought on it. But I don't eat fish at all because I've had so many lectures, and spoken to so many people who can speak knowledgably about just how bad the state of the world's fisheries are that I don't want to be part of it."*

9.2.5 Mood

'Mood' seemed to affect the diet behaviour of young people in all groups. Sometimes, eating unhealthy was described as a spur of a moment decision, taken without thinking or when they had drunk alcohol:

> *H01: "It's the mood you get up in. I dinna ken. I think that if it's a nice day, like you can go and get a bottle of water and things like that. But if it's a crap day you just sit in and if its raining outside, and you just eat everything. I think sometimes as well it depends on how feeling in yourself. If you're feeling down and depressed or whatever you just tend to eat everything that's going…"*
>
> *V01: "Well sometimes you just fancy a takeaway."*
>
> *V02: "...or like if you've had a couple of drinks and you're hungry on the way home, pizza chips or something."*

9.2.6 Subjective norm (expectation and pleasing others)

During the focus groups there was no strong evidence that young people ate healthily to impress others. Although not explicit, among the university/college students, there seemed to be the expectation that they did what their mothers taught them:

> *C01: "Want to eat healthy because that's what I'm used to (at home)."*

In contrast, one participant from inner city was expected to eat unhealthy when they went out with siblings:

> *H01: "Just like my sisters and things. When I'm with them. They're really skinny, so they can eat what they want and we go and they have McDonalds and Chinese and things and I just do it as well."*

In an inner city focus group, however, one of the leaders who was present had some expectation for participants to have a healthy diet.

> *a(leader): "...but that's ok because her baby is young but once the baby's up she'll need to make soup and that."*

9.3 Knowledge and sources of Information

9.3.1 Knowledge about diet

In spite of some misconceptions about healthy diet (see section on assumptions), most of the young people, irrespective of education or socio economic status, had a reasonable awareness of what constitutes a healthy and unhealthy diet:

> *P03: "Crisps, sweeties. I have like a packet of crisps and a sweetie and like a bottle of Irn Bru every morning before I start work. That's not really healthy*."

> *H01: "Takeaways. Irn Bru is the worst thing I think. I drink about six cans a day."*

All participants had heard about 'five a day' and were aware that eating fruit and vegetables benefited their general health. They recognised eating in between meals and skipping meals was not good for them. Some believed that what they ate now would have an affect later in life and that it would be hard to lose weight as they got older:

> *M02: "That's a reason as well...Definitely effects later if you just kind of good lifestyle."*

> *H01: "Harder to lose weight when you're older."*

It was unclear during the focus groups what young people meant by 'snacking'. Across all the groups, snacking and unhealthy food mostly meant chocolates, crisps and fizzy drinks and it seemed that all snacking was considered unhealthy.

Sources of information about healthy diet for participants were mainly parents, books, the internet and checking calorie content on packets of food. Participants felt there was enough information about healthy food, however, those at university thought that there was a great deal of misinformation in the media and the internet:

> *T05: "There is a lot of misinformation both in the internet and the media."*

9.3.2 Influencing others' behaviour

Based on their knowledge, participants from the university group had tried to influence the diets of friends and flat mates, but had not succeeded:

> *T01: "So he'll (flat mate) buy Weight Watchers ready meals, Weight Watchers yogurts, this and that I'm like …just make it yourself. It would be even better for you, and wouldn't cost you £4 a meal. ….And I'm like …, just watch me make soup. You chop up the vegetables put them in the pan, its fine. But he's like, no, no, no, its far too hard, these ones taste much better. He's just not really interested."*
>
> *T02: "We (participant and her friend) just have different diets. She has her ways. We're both quite set in our ways I think. We discuss it sometimes. But she likes what she likes, I like what I like."*

9.4 Attitudes

9.4.1 Attitudes towards diet

Participants felt that they needed some 'excitement' from eating food and that too much pressure to eat healthily could be counterproductive. It was also felt that it was easier to eat vegetables – by adding them to cooking – than to eat fruits:

> *T01: "I would rather enjoy food than you know be skinny and be healthy. I think you need some fat in your diet and you need some excitement from eating as well or you just go off the whole experience."*
>
> *H01: "I think if you set out to do something (eat five a day) it makes it worse....because its like you've got to do it ..so I think that makes it harder."*
>
> *V02: "I think I find it easier to eat vegetables .I just think its easier to add vegetables to things than it is fruit."*

Participants from the inner city group, in spite of saying their diet was very unhealthy with lots of snacking with crisps and fizzy drinks, had a long discussion about dislike of the taste and smell of Fast Food (McDonald's). However, they said they continued to eat it because it was easily accessible and cheaper:

> *P04: "(At McDonald's) Sausages. When you cut and you see all the fat and everything."*
>
> *P01: "You'll just never catch me in McDonalds. There's no way. Are you joking? I haven't been... I just can't stand the smell. They put too much salt on the food so they'll obviously try to get you to buy more drinks."*
>
> *P02: " I canna eat McDonald's..makes me sick."*
>
> *P04: "I only used to go to McDonald's because we got it cheap at my work."*

While taste was one of the major influences on food, attitudes towards the taste of healthy and unhealthy food were varied. When asked about the reasons for the type of food they ate, there was an agreement that healthy food was tastier and even those who did not eat fruit and vegetables did not complain about the taste. However, some thought that unhealthy food was more appetising:

> *T01: "(Eating fish)Usually taste, yeah. And also its (fish) good for the brain, which is handy at uni I think. Um, but yeah, it is mainly taste. (All in group T0 agreed that taste was the reason for what they ate)."*
>
> *H01: (Is junk food tasty) "Yeah. No, not really, cause fruit is fine and vegetable and that are fine."*
>
> *C06: "healthier food just tastes better as well. Get a good meal and you feel more satisfied and you probably won't go back and snack."*

M01: "Healthy options taste bad and the unhealthy options taste good. Well their healthy options are the little bowls of salad which I think is a bit boring."

One person also felt that taste of food was acquired and that they might not like the taste of unhealthy food if they were not used to them:

M01: "I think it's an acquired taste these sweets and chips and things. But if you've never really had them and then you try them you think "yuck it really doesn't taste good". "

9.4.2 Attitudes towards cooking

Participants from the university group thought it was relaxing to cook and it took the same time as cooking something unhealthy in the oven. For those who did cook, it gave them the satisfaction of making something and knowing what had gone into it:

T01: "if you love eating.. you like cooking cause you're making something. And cause you made it you know its going to be good."

Even during times of stress, university participants felt that they could spend time cooking healthily and were influenced in this respect by their upbringing and their mothers (as highlighted in the section on positive influences):

T03: "I find it quite relaxing just to take a break from studying. Take maybe half an hour to cook and half an hour just to eat it. And then I'll feel like, now I've had my break and now I've got the energy to keep going again. And then I feel cooking a simple but decent meal takes about as long as putting a pizza in the oven and wait for it to, finish, to cook itself really."

In addition to the positive attitudes to cooking, as highlighted above, negative attitudes were also expressed across groups. Participants from the university/college felt that they did not like cooking, that it was a hassle to cook and that it was a lot of effort to prepare and cook:

T05: "I hate cooking.. Basically I just cook because I have to. Time is a factor but not too often."

C03: "It's just the effort that you've got to put into cooking. Or the expense. It's easier just to open a tin than to like chop vegetables and stuff."

C02: "I was just going to say that it's easier as well (eating outside). If you go out you don't have to cook anything. You can just walk in and buy the stuff."

In comparison, participants from the inner city groups said they did not know how to cook and were not confident to make a healthy meal:

H01: "I canna cook just now, I'm just learning to cook."

P02: "Na...I'd be scared to eat the food I cook. I'd be scared of food poisoning myself. I couldn't even cook at school."

However, when asked if they would eat healthier if they knew how to cook, inner city participants agreed that they would:

K01: "Probably aye….Mak more healthier stuff."

9.4.3 Lack of concern

When participants were asked if they were concerned about their diet/future health, across all the groups, 'future health' was not a main concern for many of the young people. The immediate effects and the desire to look and feel 'great' was more important to them than any long-term health benefits:

T05: "(future health) Not concerned. Sticking more to it (healthy diet). That's the only point.."

M01: "I don't think that (future health) really affects me."

V02: "Just like, well like, its not my first thought (health). Obviously that's the benefit of it but like if I start eating healthy it is like, ok, well maybe my nails will look better now or my skin won't be as clogged up. Or I won't put on as much weight if I eat lower calorie food."

For some, eating unhealthily was not a concern as they did not put on weight hence there was no incentive to eat healthily and the view was expressed that 'you live only once'.

C07: "Eating unhealthy doesn't bother me too much. I don't know why. I don't gain weight or lose weight if I eat healthy."

K02: "Not a lot (don't worry about diet).. if I cut out the fat...I hae nothing xxx If i am fat ..I am fat"

However, though less recurrent, the possibility of gaining weight, becoming anaemic and being damaged inside was a concern:

V01: "I don't think it's like too bad that I worry about it... well just like weight and, health in the back of my head. More weight than anything else."

C02: "Because if it was showing then I'd just know I was putting on weight then I'd be like I just need to change my diet, do exercise more and lose weight. But because I've not really putting on any weight I'm worried it's damaging me on the inside."

9.4.4 Attitude towards others' diet behaviour

Participants who thought that they ate healthily, felt that their flatmates were unhealthy because they did not cook from fresh ingredients while those who had an unhealthy diet, felt

that their friends and families also ate unhealthily. One participant did not believe in counting calories or going to the gym in the morning to exercise:

> *P02: "They're (work colleagues) all skinny but they check everything for calories..what is the point ...They go to the gym nearly every morning at half past six in the morning. I was like. Na."*

Exposure to healthy food at schools for fussy children was perceived as a good idea by the young mums:

> *H01: "That's how school dinners is good because they go and then they get made to try a bit of it. X has tried a lot of things, like vegetables curries and things like that since she's (daughter) started going to school dinners. Tuna, salmon, things like that. She's like oh they're really fine but if I was to give her them at home she wouldn't eat them."*

9.4.5 Attitudes towards health messages

Irrespective of the groups, they felt there was enough information about health and 'five a day'.

> *P02: "(health messages on five a day) Oh, its all over the place. Get your five a day."*
>
> *P04: "My mum used to work as a creche worker for 15 years so yeah you kind of grow up with it (healthy messages)."*

Participants from the community groups felt that health promotion messages were useless information and that no one listened to them and it would not encourage them to act. Contrarily, one person went to have a fag whenever she saw the advert for cigarettes. The students from university, however, felt that available information on healthy diet could be misleading (as highlighted above):

> *P01: "(health messages) Heap of rubbish.... They don't look at what's advertised. They go for the food that they like."*
>
> *P03: "Nobody listens to them (health messages)."*
>
> *K02: "To be honest...that (health messages) is a heap of crap (laughs) ,specially all that stupid milk shakes ...what is going into them...don't understand."*

9.5 Behaviour change

9.5.1 Reasons for changing past behaviour

Being brought up in a healthy environment, and being exposed to healthy food by friends when they first lived independently, helped participants to revert back to healthy eating behaviour. For some of the participants, although they were not getting fat, the lack of energy, the feeling of disgust after they ate unhealthy food, recognition that it was not a viable way to live and feeling guilty, helped them to return to healthy eating behaviour:

> *T03: "That (eating healthy) basically started when I went backpacking for a year. I used to live with a girl who was really into healthy living. And that's basically when it started."*
>
> *C01: "Want to eat healthy because that's what I'm used to and it feels wrong to eat so unhealthy."*
>
> *T05: "First year (at university) was tragic. But second year and third when I started to do more internet searching for what's healthy, ...I changed my dieting, and changed my eating, cause I wasn't getting fat or anything. But I was probably more out of energy, tired, and just not feeling good."*
>
> *T02: "Just realised it (unhealthy eating) wasn't really a very viable way of staying. Cause I was going to put on a lot of weight if I carried on....so I made a conscious effort to kind of change. But it was something I felt more comfortable with because it's what I used to eat at home."*

9.5.2 Intention to eat healthily and perceived behavioural control (PBC)

Young people who ate relatively healthily showed some intention to keep up with a healthy diet:

> *V01: "Sometimes you just fancy a Takeaway or something easy rather than preparing a proper meal. But I try and eat healthily."*

However, among participants who did not generally eat healthily, there was no strong intention to change their diet. Even those who had good intentions to have a healthier diet were not very successful:

> *M02: "No I never do this (no intention)..It's my mood."*
>
> *V02: "I always have good intentions about .....but cake and things always gets me. Pizzas and stuff like that."*
>
> *H03: "Aye. I always say it (eat healthy) but never do it. …dinna ken. Its just. Dinna ken seem like a good idea....aye, yeah. But I never ever do it. Never."*

One participant had a recent health scare (anaemia) and, in spite of that, there was no intention to start eating healthily immediately:

K01: "No.. I will start next week (laugh)."

There was some evidence of control over their diet (PBC) among young people. They were capable of saying 'no' to unhealthy food, confident that they would eat reasonably healthily if they had to live on their own and could lose weight if they wanted to:

R03: "Yeah I think in general I have a healthy diet. I mean I like chocolate and cakes, but I just make sure it's not too often."

V01: "I try to (have a healthy diet) but it doesn't always work."

K02: "Probably if I tried ..probably I could lose a bit of weight...something I could do."

9.5.3 Motivators to change behaviour

When asked if anything would motivate them to consider changing their diet, support from partners and family was seen as motivator to eat healthily. Those who had the support in the past had succeeded in achieving their goal, while those who did not had given up (highlighted under influences)*:*

P03: "I think if my partner. …If he changed his diet then I'd change mine and we could work on it together. Unless he does that I don't think I would do it on my own. I think support from him would be needed as well. If he took more responsibility in what he was eating then I probably would change my diet."

K01: "My mum and da.. make it with me (cook) and that .. .. having their support and all then..."

H01: "When I was eating healthy my boyfriend did it as well so it was easier for me."

One person felt that if he eliminated the fat from his diet then there was nothing to eat and so becoming obese would be the only motivator to help him eat healthily:

K02: "If I get to the stage of being obese (laughs)."

There were two girls who mentioned situations which might point to eating disorders, although not explicitly mentioned. One of them said that she wanted to be skinny when younger but she has put on weight now and feels better. The other one said she was a binge eater when she was younger but did not give any further information.

9.6 Summary

Diet behaviour was varied among young people. Participants were reasonably knowledgeable about what constitutes a healthy diet, apart from some misconceptions about types of food. The diet behaviour was strongly influenced by their parents/ childhood experiences and the need to have ‘variety’ in their food. It was driven on a daily basis by various stresses (such as exams, lack of time, mood) and their organising skills during those times. Consequently, there was evidence of going through ‘healthy eating phases’ with relapses where these factors came into play. Those who had gone through a healthy eating phase had experienced the benefits of having a healthy diet. The major motivators to either eating healthily or getting back to healthy eating seemed to be to ‘look better’ and ‘feel great’ now, rather than being concerned about future health although this was of some concern. There were mixed opinions about the ‘cost’ and ‘taste’ of food. Young people generally were not prepared to invest time and energy to cook healthy food but looked for easy options even, if they knew this was unhealthy. Support from family/friends and partners and skills to cook healthy food were identified as possible motivators for changing and sustaining a healthy lifestyle.

Chapter 10: Results - Physical activity (PA) in young people

This chapter focuses on the physical activity (PA) of young people with different educational and socio economic backgrounds based on responses from the seven focus group discussions. A reminder of the characteristics and 'codes' of the focus groups, are presented in the Table 8.1 below.

Table 8.1 Characteristics of the focus groups

Focus group	**Code**	**Characteristics**	**No of participants (M/F)**	**Mean age (range)**
Aberdeen University	***T0***	Older group	5 (1/4)	22 (20-24)
Aberdeen University	***C0***	Younger group	8 (3/5)	19 (18-19)
Aberdeen College	***V0***	Working/training 1	2 (0/2)	21 (20-22)
Aberdeen College	***M0***	Working/training 2	2 (1/1)	20 (18-21)
Aberdeen City – Torry	***H0***	Young mothers	3 (0/3)	23 (21-24)
Aberdeen City – Mastrick	***P0***	Mixture of working/not working	4 (0/4)	19 (18-21)
Aberdeenshire - Mintlaw	***K0***	Community Youth group- not in education or employment	2 (1/1)	19 (18-19)

Analysis of the focus group discussions around physical activity (PA) identified five main themes. They were: physical activity behaviour, influences on physical activity behaviour, attitudes, behaviour change and knowledge. Within each of these themes, several subthemes were identified as presented in the Table 8.3 and discussed below.

Table 8.3 Physical activity (PA) of young people: themes and sub themes

Themes	**Subthemes**
1. Physical activity behaviour	• *Present behaviour* • *Past behaviour*
2. Influences on physical activity behaviour	• *Positive influences* *Parents/partners* *Necessity* *Reasons for exercising e.g. feel better, more energy* • *Negative influences* *Lack of facilities* *Time* *Cost* *Lack of privacy/confidence* *Competitive sports* *Parents* *Lack of company* *Reasons for not exercising e.g.weather, injury* • *Assumptions* • *Preferences* • *Subjective norm (expectations and pleasing others)* • *Values*
3. Attitudes	• *Attitudes towards physical activity* • *Attitudes towards others physical activity behaviour* • *Concern for future health* • *Attitudes towards physical activity promotion messages*
4. Behaviour change	• *Reasons for changing past behaviour* • *Motivators to change behaviour* • *Intention and PBC*
5. Knowledge	• *Knowledge about physical activity* • *Influencing others*

10.1 Physical activity behaviour

10.1.1 Present behaviour

Physical activity levels varied among young people ranging from moderate activities (Department of Health 2004) such as brisk walking, jogging, swimming, cycling, playing squash, dancing, working out in the gym to vigorous activities such as kite surfing, rowing, mountain biking and martial arts. Older (aged 20+) participants studying at the university and those from one of the college groups did more vigorous activities compared to the other groups. The main forms of physical activity otherwise were walking to places, looking after children and that undertaken during the course of paid employment.

Whilst T02 and M02 undertook regular physical exercise as indicated here:

> *T02: "I cycle quite a bit, like basically where ever I go I use the bike instead of the bus. I play squash once, two, twice a week. I dance ballet. Anything else? Oh yeah, during the summer I do kite surfing."*
>
> *M02: "I do quite a lot too. Running and hiking and stuff. I live so far away if I then go mountain biking I just take it up to the Highlands."*

For others, physical activity was incorporated into their everyday lives:

> *V02: "I think the only exercise I get is really walking places. And I do walk quite a lot. And just at work, running around at work."*
>
> *P04: "Asda I work 15, 16 hour days. We used to walk to work, walk all day, and then walk home at 10 o'clock at night. Wondered why I was tired cause I had to get up at four in morning the next day."*
>
> *H03: "Aye, never sit, never get a seat. With my kids. Up and down and that."*

10.1.2 Past behaviour

Irrespective of the groups, all young people felt that they were more active when they were younger and that their levels had decreased as they got older:

> *C08: "I used to cycle a lot. And sometimes I went to rugby classes. It was fun. Swimming as well. So much more active than here."*
>
> *P02: "We used to go to a girls' group down at Summerhill. They've got like a rock wall in Summerhill. ....They used to get the trampoline out and we just used to do heaps of different stuff."*
>
> *K02: "Used to play foot ball. I used to do running."*
>
> *T02: "Back at school I used to do a lot of jogging."*

M02: "I used to be much more when I was about 14, 15, 16. I was really, really quite madly sporty but I've toned down a bit."

10.2 Influences on Physical Activity Behaviour

Physical activity among young people was influenced by many factors both positive and negative.

10.2.1 Positive influences

***Parents/partners*:** Parents had some positive influence on physical activity of young people from university and college. Being exposed to physical activity at a young age by parents, observing their fitness and being encouraged by parents to join a sport or gym seems to have helped them keep up their physical activity level:

C01: "My father on the other hand he's 50 years old, I think, and he's really fit. So maybe that's what influenced why I started running in the first place but it's not why I run now. It's more like why I started it."

C05: "But you're like "I can't really be bothered". And my mum's like "well I'm going, so I'll go with you". It's like "OK I actually will go then". It's more encouraging to do more."

M02: "I think, well my parents are mountaineers so when we were little we were always dragged up a lot of mountains. And then I just, don't know, I suppose that influenced it a lot."

One participant's boyfriend had introduced her to a new sport:

T04: "Like the squash playing.. for example took me a while.. My ex-boyfriend introduced me..."

Necessity: Necessity made few young people exercise (walk). One participant from the university cycled everywhere for convenience. Absence of other mode of transport and lifts not working at the workplace made some young people walk:

P02: "If customers bug me for shoes I can't be bothered waiting for the lifts so I just take the stairs. I get that 24/7."

T04: "Oh, for convenience. I have serious issues with getting myself to do exercise."

Reasons for exercising: Across all the groups, the reasons given for exercising were that it made them feel good, cleared their minds, enabled them to do things physically and be healthy. Those who did exercise felt they did so because they enjoyed exercising. Younger

university and college students also felt that exercising helped them counter feelings of depression and grumpiness:

> *M02: "Makes me feel really good. Especially if, I don't know, I just feel really relaxed afterwards. It's just a really relaxing thing."*
>
> *C01: "I have to exercise because otherwise I feel bad...So if I don't exercise I feel that I'm getting depressed. Not really depressed depressed. But I start like feeling bad, my whole body."*
>
> *M01: "Well I just love it. Concerning cycling I love it."*

One university student, however, did a variety of sports to simply be '*good at things'*:

> *T01: "I like being good at things. And you see all the people struggling and I'm like, yeah, I can totally do this."*

Another inner city participant, not at university or college, but was working found that exercising made them feel confident:

> *K02: "I don't know. Feel a bit confident.. to do more stuff....Just feeling happy ..you know."*

10.2.2 Negative influences

Lack of facilities: Inadequate facilities such as lack of equipment in the gym and poor cleanliness of pools were seen as a major problem by the majority of participants across all the groups:

> *C06: "I've been to this gym. Here. And it's just not suited for the amount of people using it. It's just too small, the actual..... (c05 interrupted and agreed that machines are always taken. The weights, and stuff.) because it is just so crowded it is not a good environment to be in."*
>
> *M02: "The pools in xxxxx are quite disgusting."*

Participants from the inner city group felt, that while there were facilities available for the younger generation, nothing was available for their age group:

> *P03: "They've got a lot more facilities for like the younger generation. But nothing. They don't. They tend to forget about us. I don't think there is enough for people our age to do."*

Time: Due to lack of equipment in the university gyms, the time taken up in terms of travelling to the gym and waiting to use the machines seemed to be more than what young people in university/college could afford:

T01: "You go to the gym. You have to wait 20 minutes to get in. You then have to queue for all the equipment. It's kind of off putting. So when a gym session that would take you an hour, takes you two hours by the time you've waited for everything, and waited to get in."

M01: "I wasn't doing this too much the last month because there were exams so I didn't have time for that."

In comparison, for those who were working, time was an issue as they worked long hours:

K02: "Work makes my life difficult. Nae time to do anything else. It has to be done."

Cost: Not being able to afford to pay membership for the gym/sports club and not having the personal equipment (such as a good pair of trainers or a bike) were seen as barriers to doing adequate exercise:

C03: "I would like to do more exercise. But I don't know. I don't have the money to join the gym, or do anything."

T02: "I haven't got any trainers and I can't really afford them."

V01: "The gym's are so expensive as well. It's £32 a month. It's not that much but being a student it is a chunk coming out."

For the participants who lived in rural areas, travelling cost was an added burden as there were no facilities available locally:

K02: "Aberdeen is not that far. It is just the cost....to getting there and back...never mind the membership for the gym and that."

Lack of privacy/confidence: Irrespective of the groups, females felt 'inadequate' and 'embarrassed' to go to the gym/swimming pool or jog in the streets. Some of them at university lacked the confidence to join a new activity with no experience or join groups that had already started. However, those who had joined late reassured them that it was not the case:

T02: "I'm a bit scared of the gym. I'll be rubbish and just embarrass myself.... And I don't like the idea of jogging where other people can see me."

H01: "The gym..... I think is just a bit embarrassing going to the gym. Going in and its all men. I couldn't go...I'd like to be able to just head to the gym when I've got a spare hour or something but I just canna. Too embarrassed."

C07: "No, I thought of that as well (It would be scary to join a new group late) but it isn't the case actually. Cause when I started rowing, there's still some people who are like the same.. as me, which is just started. So we got together and start going to races and stuff, so."

Competitive sports: Wanting to do different sports to be '*good at things*' (as highlighted above) and an element of competition was important to a few participants:

K02: "If somebody swimming better..I want to swim better than them..just dinna ken"

However, competitive sports had a negative influence on both younger people at university and those in inner city areas:

C03: "I think it's quite intimidating. I would have thought about joining some societies. But then, I thought like "am I actually good enough to do that?" Like I'd hate to just go along and everyone was really really good. .. And I would hate to be the only one like that. Like I'd rather do something by myself like swimming or something. Instead of like a society or a team sport that's competitive."

P02: "(Friends) Took me roller skating, I must have been about 10 miles behind, they were 10 miles in front. I was like "right just leave me."

Parents: Parents of participants from university and college appeared to have had a positive influence on students' physical activity (highlighted above), however, the participants from inner city groups did not have that benefit:

H01: "None of my family exercise."

P02: "Our family's all alcoholics. They don't exercise."

Lack of company: Lack of company had a negative influence on younger students (18-19 year olds) from university, college or those who were working/not working. They felt embarrassed and did not have the determination to do physical activity without company:

C03: "I think it is because like everyone else I know doesn't do exercise. Yeah. So I think that makes me feel, that makes me more lazy as well."

P04: "Don't really want to go swimming on own either. Looking like a plug, if you walked into a swimming pool yourself."

K02: "It's because...I dinna haven't got the same like... determination to do anything if someone else was not there .."

In contrast, one young mum, felt that she would exercise if she wanted to and would not worry about lack of company:

H01: "If you really want to do it then you will and if there's somebody else who's doing it then. Doesn't bother me. I'd do it if I wanted to."

Reasons for not exercising: Some of the other reasons given for not exercising were that they could not be bothered and felt lazy, bad weather, concern about safety (cycling in the city/walking in the dark) and previous injury:

C02: "Because I think if I could be bothered, I could get up and do something myself but I just can't be bothered. ...Like my flat mates all go out to the gym at like. But they go at like 9 in the morning, or half eight in the morning and stuff, and I can't be bothered getting up at that kind of time so I just don't bother."

P01: "I'm quite lazy. I am properly lazy, believe it or not. Well like I said, the Chinese is across the road from my house. Last night I could easily have walked down the stairs and across but nup, I phoned them and got it home delivered to me.... that is lazy."

H01: "Aye, if the weather's crap then you canna go. if it is raining that spoils your whole week for exercising, cause you're never getting out."

C04: "If they're at night as well. Cause I don't particularly like wandering around in the dark. Even if I got a bus back I don't like hanging around waiting for buses."

Although most participants felt that they would not go out to exercise in bad weather there was one participant who was motivated to go out even in bad weather:

M01: "Yeah rain, the weather. But even if it rains I go cycling."

10.2.3 Assumptions

Irrespective of the groups, there was an assumption that only working out in a gym or participating in an organised sport was physical activity. Walking and active living was not considered as proper physical activity:

T05: "Walking doesn't count as exercise."

T02: "I don't really do a lot of exercise. Every now and again I consider the gym. But I've never been to the gym. ..... As I say I don't really do much exercise. It's strange I walk everywhere. But you're right (T05's comment above) it's not really exercise its just sort of a practical thing."

One participant from an inner city area who did manual work still felt that she was not doing adequate exercise:

K01: "Making up all the tables is working is it..?"

However, later when asked if they had intentions to do more exercise, participants from the inner city groups contradicted themselves by saying that they already did enough exercise either at work place or looking after children at home:

P0: "We do enough during the day when we're at work."

H03: "They (children) keep you on your feet don't they?? All they do is "Mum, mum" it's all you hear."

10.2.4 Preferences

Type of exercise/setting: University students did not like jogging in the constraints of the city environment but preferred the country side. The artificial environment of playing indoor squash did not appeal to them, and solitary exercise such as swimming was preferred rather than doing team sports. An alternative view was that exercising at the gym was the most convenient and easiest way to do exercise since this did not need as much planning or organising as would be required for a sport like badminton:

T02: "I really enjoy jogging through the countryside. Or jogging with my dog, or something like that. Going out and jogging round a few roundabouts... I don't like kind of exercising in the city, I don't know."

T04: "Like the squash playing for example took me a while as well. Cause it's completely stupid. I'm in a small box pushing a ball against a wall."

T01: "I think the gym is convenient. I finish uni and yeah it would be great to get a game of badminton or go for a run. But it's, that is a lot more self-motivated. Or you have to plan if you're going to go and play a sport. Whereas the gym, you just take your trainers to uni and you go in there at 5 o'clock. Like it's a lot easier."

Walking: In spite of the assumption, that only working out at gym was proper exercise (highlighted above in the section on assumptions), participants across the groups preferred walking to other exercises. It was felt that walking saved money to spend on other things and it was less strenuous:

T02: "I do have a car but I just sort of resent spending money when I don't need to. That's why I walk everywhere."

C04: "Whereas walkings more, sort of, em, I don't know how I'd call it. It's not as strenuous and everything. You don't really realise you're doing exercise, while you're doing."

Young mums felt that their young children, who could not go to the gym with them, could be included in walks:

H01: "Yeah. It doesn't cost anything. And you can take your kids with you as well for walking. You can't take the kids to a gym."

In contrast, in response to a comment made by one participant in an inner city group (P04) that walking was exercise, P02 responded that she preferred doing other exercises than walking:

P04: "You can get some exercise walking to pictures."

P02: (responded) " I would rather do exercise exercise. I would rather go trampolining."

Diet to exercise: A participant from the older university group highlighted the fact that eating healthily was a preferred choice for a healthy lifestyle than exercising as it took more effort to exercise:

T02: "It doesn't make sense that I'm so concerned with healthy eating and stuff and not with the exercise. So, that's a big thing for me. But is a bit of an effort. I wanted to eat healthy in a way that I don't really want to exercise. So. Making the effort is a bit. It feels like more of an effort."

10.2.5 Subjective norm

There was no strong evidence from the focus groups that young people did any form of exercise to please others. One participant from the younger university group felt that there was an expectation to do exercise. University students from the older age group in fact resisted the pressure to imitate celebrities to do strenuous exercise but were keen to exercise for their own enjoyment and benefit:

T04: "I'm just like. I feel a little bit. I think I get this image of this supermodel who has to take really good care of her diet and her exercise. And I'm just, this is not my life. I like to do things for the purpose of doing them, enjoying them. Not for social constraints or whatever..."

T02: "No it's not other people. It's me. I know it's good for me. I know it would enhance fitness."

C02: "Because you just. You should exercise a bit more. It's expected of you as well."

10.2.6 Values

One participant from the older university group cycled and walked a lot to save energy:

T04: "I think I'm just such an ideologist. For example, I prefer taking the stairs instead of the lift and I have to inhibit this reaction of taking the lift because it's actually easier. So I force myself to take the stairs instead, but that's again because I want to save the energy."

10.3 Attitudes

10.3.1 Attitudes on exercise

Participants from university felt silly about doing exercise for the sake of it. They preferred doing it for enjoyment rather than to meet any social expectation:

> *T04: "Doing exercise for the sake of exercise: I just feel silly when I do it. I simply feel silly, I can't really explain what it is..."*

While going to the gym was seen as the best option for exercising by many across the groups, cutting down on one type of exercise to undertake another type of exercise was seen as inappropriate by university students (for example: taking a bus to go to the gym which costs more rather than walking as a mode of exercise) as indicated below:

> *C04: "If I walked there and back then I wouldn't actually want to do any exercise in the middle. So the other option is to get a bus, which obviously costs more money, and you're cutting out exercise just to do a different type of exercise. Which I'd probably actually, just go to the gym and go for like 15 minutes and then give up a because I'd be too tired."*

One participant felt that PE classes should be made compulsory even at university level.

> *C08: "I think it would be good if there were like compulsory classes like, PE classes, like we did at high school. It was good. It could be good."*

College students also felt that it was hard to continue with the same exercise for a long time and would go through phases of not exercising, for example, in the winter:

> *M02: "I don't think one ever continues the same. You know you go through phases of one thing or the other. Like even if it's different sports. You'll stop doing exercise for a while."*

10.3.2 Attitudes towards others' physical activity behaviour

University and college students who felt that they did adequate physical activity felt that their friends needed to do more exercising and lacked knowledge about healthy lifestyle. The idea of a healthy life style among their friends seemed to be based purely on diet rather than exercise:

> *T02: "I think my flat mate is a bit like that. I mean. Her idea of a healthy diet is purely calorie based. So as long as she doesn't eat over 1500 or 2000 calories, if its chocolate etc. She knows that fruit and vegetables are healthy. At the same time, you do get the impression that she could do with some information."*

M02: "People really need a lot of ...and I feel that if people would just exercise properly they wouldn't need to be so worried about what they ate or things. So if my friends go on about "oh I want to lose weight" I'm just like "well come running". They don't they just deny themselves of things."

University students also felt that some of their peers did not like people who regularly exercised and would not help or join them even when offered:

C06: "Well they just hate anyone who does exercise. They think they're jocks. No. No, they wouldn't have a go at me if I did exercise. But it's just. They don't do sports. They don't do rugby football or anything like that. So we can't really talk about sports that much."

Compared to the university/college students (see section on positive influence of parents), participants from the inner city groups were not keen to take on the offer made by their mothers to exercise together:

P02: "(mum) ...she's like, "we can join together". It's like. Just you go. Go yourself."

10.3.3 Concern for future health

Participants from the university and college, although keen to stay healthy and be physically able when they got older, did not think that far into the future:

T02: "I don't tend to think into the future. I'm always aware in the back of my mind that especially as I get older some form of exercise would be a good idea. It is good for you. I'm very aware of that."

C05: "You don't want to be ill when you get older. I still want to feel like I do now when I'm older……I want to make sure, not stay young forever, but like be able to stay active. Still be able to get around, and be independent, and things like that. I know I need to do exercise to be able to be like that."

C02: "But I haven't really thought that far ahead into it that much. I still occasionally think about it but not loads of times."

In the other groups, the reaction to the concept of future health varied. Some of the inner city participants were not worried about putting on weight or about the future:

P02 and P03: "Not worried..na"

As indicated below, H02 from an inner city young mums group expressed her view that she was not worried about her weight and H03 agreed with this statement. However, when H01 expressed her concern that being obese and unfit would affect their day-to-day life with their children, H02 and H03 agreed and said they had not thought of their future health until the focus group:

H02: "dinna ken. I just don't think about it. my weight doesn't bother me (H03 agreed)"

H01: "you won't be able to run about with your kids and things...out of breath, fat and... (H02 and H03 agreed)"

A participant who was working and not in education, admitted that it was a major concern for him when feeling low and drunk although these feelings did not last for long:

K02: "Just....dinna ken.. don't know... the main thing is when .. I am annoyed and I am sitting in my house and when I am drinking just myself.. Then I think about death and stuff like that..then I sober up and then I can't be bothered.. that's it..that is what it is"

10.3.4 Attitude towards health promotion messages

Participants from the university felt that information on exercising was not readily available:

T05: "I think that there should be more information that's the thing because some people, do not have any information about exercise (T02 agreed). It took me about two years to get to this stage of knowledge that I now have."

In response to the above comment by T05, some believed that while information was available, it was inadequate and ambiguous. Health messages were seen as *'empty information'* which provided the broad facts about health but gave no detail. They also felt they did not focus on the right message for young people. A message such as *'sport is fun'* would encourage them to pursue regular exercise:

T04: "I think contrary to you (T05 above) there is heaps of information out there. I see fliers everywhere. Maybe it is the message on these fliers that at least doesn't stick with me. Because it's like "be healthy, do sports". I know that. Of course, of course. If I do sports I'm more healthy. But it's not the right button to press in my case. It would be more like. Hey, squash is so fun. It's so fast, it gives you a kick, its better than taking drugs. And I would be like, oh really, fab."

T02: " Cause they go "eating this is healthy, and doing exercise is healthy". And I'm like healthy how? …..So you're right. There is information but it's a kind of empty information."

10.4 Behaviour Change

10.4.1 Reasons for change from past behaviour

As highlighted in the section on past behaviour above, the majority of participants across all groups said that they were more active when they were younger. Their physical activity

levels decreased as they got older and/or since coming to university as shown by this participant's comment:

> *C02: "My diet has become worse since I got here (university). And I'm exercising less since I got here as well."*

However, two participants from the same university group started physical exercise after starting university:

> *C07: "I started rowing when I started uni here."*
>
> *C04: "Before I came to uni I did like no exercise at all. So walking 3 miles a day was quite a triumph for me."*

University/college students gave the following reasons for their decrease in active lifestyle: getting into the 'student lifestyle', not being able to afford trainers/gym fee, lack of time, injury and the lack of company/encouragement from friends:

> *C06: "I was doing alright but I was so knackered. And then I just got into the whole student lifestyle, boozing up and all that and that, that really cut me back. That's probably what did it. Cause you, the first few months you try and settle in. You just go out. You got no push to do anything. You know."*
>
> *M02: "And I used to play a lot of basketball as well but then I stopped after I damaged my foot. I was out for 6 months and then I didn't go back."*

Among those who were working and inner city groups, it was the lack of time after a tiring day at work and their dislike of those who organised the activities that were barriers for doing exercise:

> *P02: "We used to go swimming every Saturday morning when we were little.....I don't know. Just don't find time to go. I'm always tired after work. I just don't find the time to go."*
>
> *P04: "Cause I didn't like the folk that did it."*
>
> *K02: "Work makes my life difficult. Nae time to do anything else. It has to be done."*

10.4.2 Motivators to change behaviour

During the discussions, participants identified factors that would motivate them to change their behaviour. Company and/or encouragement from friends and partners were identified as motivating factors to increase physical activity by all groups as indicated by an example below:

C05: "If there's someone else telling you to do it. If there's like one voice in your head saying "I can't be bothered to go but I know I should". But you've got an outside voice saying "yeah I'll go with you". You're more likely to go."

Non-competitive sports/activities, good publicity of sport clubs/activities were motivators for university students:

C01: "If they wouldn't have been so competitive or whatever, maybe I would have joined them any how."

Inner city groups, however, identified facilities tailored for their age group with subsidised fees, setting goals to achieve targets and group discussion on health as motivators:

P04: "Just maybe like somewhere we can where like, a trampoline….and doesn't cost money to do."

H01: "You know how they give you points and things. And you're going there every week to get weighed. That's a goal for you isn't it so you would stick to it. I think that would help. I just haven't got into that either yet. I think that would help me doing something like that."

K02: "All this speaking about what I could do to lose weight and stop smoking and....just sat there thinking ....just speaking about it is makes me think about it."

10.4.3 Intention and perceived behavioural control (PBC)

There was strong intention to do more exercise across all the groups but there was no evidence of perceived control of behaviour. Intentions were not translated into action for many young people:

T01: "Again, good intentions ...whether they will ever come to anything I have no idea. I just feel it would be good for me. It would em. And when I did jog I did enjoy it, so I know I do enjoy it, it's just actually getting all of the things together and doing it."

M02: "The female friends I have in the college are always going on about xxxx and not exercising enough and all that stuff.. Doesn't turn to action."

C06: "I'd rather play rugby but its just so much easier to get drunk."

K01: "That is my New Year's resolution is to eat better...exercise more..cut down on smoking. Don't know what will happen."

C04: "So I'm thinking that once the exams are over I'm going to change my diet a bit and start exercising more and try and get back down to what I was."

10.5 Knowledge

10.5.1 Knowledge about physical activity

Across all the groups, young people were aware of the benefits of exercise and the consequences of doing less physical activity:

> *C05: "If you don't exercise, you're going to get unhealthy. You always read in magazines and see on TV. If you don't do exercise you're going to get heart disease and die when you're 50. ..... Still be able to get around, and be independent and things like that. I know I need to do exercise to be able to be like that."*
>
> *K02: "I will get a lot bigger than I am. I will be massive in next 10 years like.. If I don't start doing any exercise..I would end up massive."*

However, the participants from the university felt that they should be educated on types of exercises and the benefits of each:

> *T02: "I don't know much about sort of exercise and what it actually does for you and what different types of exercise do for you."*

10.5.2 Influencing others' behaviour

A few participants (from college and the inner city group) tried to motivate others to exercise without much success:

> *M02: "I drag them (friends) up the stairs everyday. They always "I'd really like to go with you". But they never do. And if they do they just get really tired and then it was such a big effort. It doesn't really inspire them to go again really."*
>
> *P03: " I say 'Do you want to go swimming??'. Everybody (friends) is like, 'no'..."*

10.6 Summary

Physical activity level among young people varied widely ranging from moderate activities among participants from most groups to vigorous exercises amongst a few of them in university and college groups. The reasons for exercising seemed to be that they enjoyed exercising, felt well afterwards and they wanted to be physically able. However, irrespective of the group, the level of physical activity decreased with age. The reasons given for the decreased activity were ‘student lifestyle’, lack of company, time and cost restrictions. There was an assumption that only working out in the gym and participating in organised sports was good physical activity. Parents had both positive and negative influence on their behaviour. While ‘being good at things’ was identified as a motivator, competitive sports was seen as a discouragement for some. Enjoying an activity with someone to go with or chat to was preferred by young people rather than doing it alone or for competition. However, a few preferred to undertake solitary exercise rather than join groups. Health messages to promote exercise were seen as ‘empty information’, as it did not give the right message that was attractive to this age group. Young people were concerned about their levels of exercise and the impact on their future health. They felt that setting achievable goals supported by subsidised facilities that catered for young people would motivate them to do more physical activity.

Chapter 11: Summary and reflexive discussion of the qualitative study

11.1 Summary of qualitative study

Focus groups conducted among young people from varied educational and socio economic backgrounds showed that while there were similarities in some aspects of their diet and physical activity behaviour, there were also differences. University students were fairly confident that their diet was healthy while those from inner city areas felt they ate unhealthily. There is a possibility that university students might have expressed a view that was socially desirable and conforms to social expectations (Owen 2001). When it came to levels of physical activity, however, across all groups, confidence that they did adequate amounts of physical activity was relatively low. Young people from university/college recognised that their diet had become unhealthy as they got older (19-20 years and above) and attempts were made to change their diet. For physical activity, however, in spite of the recognition that they were not doing adequate exercise, physical activity levels only seemed to decrease with age across all the groups. They had intentions to do more exercise but little attempt was made to convert these intentions to actual behaviour. A few participants from the inner city areas felt that they derived enough exercise from their jobs and looking after their children.

Irrespective of the level of education, there were some assumptions influencing young people's diet and physical activity behaviours: only fresh ingredients and organic food was considered healthy, while tinned food and readymade meals were considered unhealthy. Walking was not considered as physical activity. Only working out in a gym or doing organised sports was considered 'proper' physical activity. Parental influence was strong on young people's diet - both positively and negatively - although this influence was not as strongly reflected on physical activity behaviour. There seemed to be a perception that changing diet was easier and was preferred compared with doing more exercise with the latter taking extra effort.

The health consequences of an unhealthy diet and inadequate exercise, was well recognised by young people, irrespective of the educational and socio-economic status. The main motivation in attempting to or wanting to change their diet or physical activity level was to look and feel better and not because of any real concern about the long-term health consequences. Eating unhealthily during times of stress (exams/ work) seemed to be due to their lack of planning and organisation, leading to phases of unhealthy/healthy diet. This was a major diet behaviour factor, while the lack of company and pressures of competitive sports were specific negative factors for inadequate physical activity behaviour. In all groups, lack of time and money was highlighted as an important barrier for a healthy lifestyle.

11.2 Reflexive discussion on the qualitative study

The initial intention to undertake a mixed method approach for this thesis was based on the understanding that it was an appropriate methodology to address the research questions that would help to understand the lifestyle of young people, their perceptions and experiences to a depth that might not be possible using a quantitative study alone. The mixed methods study combined methodologies that were from different paradigms with different assumptions in terms of data collection and analysis. The conventional standardised research instrument that was used to measure the research outcomes (obesity, diet and physical activity among young people) in the quantitative research was believed to demonstrate 'reliability', 'objectivity' and 'generalisability'. On the other hand, the qualitative data obtained by focus groups discussions, leaned towards the interpretivist stance, which stressed the importance of interpretation as well as observation in understanding the social world (Snape D & Spencer L 2005). This is integral to the qualitative tradition. Having a firm background in quantitative research and trying to combine the methodologies could have introduced bias in the way data was collected in qualitative research. For example, a need to have adequate sample sizes for generalisability and the temptation to count numbers during analyses. Literature suggests that one way to address this is for the researcher to be 'reflexive' by making the process of qualitative research and prior assumptions/biases explicit and transparent (Jennifer Mason 2010;Mays N & Pope C 2000;Snape D & Spencer L 2005).

Consequently, some of the issues reflected below are in the first person to demonstrate my personal reflection on the process.

11.2.1 Inductive qualitative research vs theoretical underpinning in quantitative research

Undertaking a qualitative approach proved quite challenging having come from a purely quantitative research background. I constantly struggled with concepts such as 'objectivity' and 'validity' within qualitative research. As a beginner to qualitative research, I read and tried to understand the key approaches to qualitative research and the philosophical backgrounds to the different approaches. From my reading it emerged that the main principle of qualitative research is to be 'inductive' rather than 'deductive'. Inductive process involves using evidence from observed data to come to a conclusion while the deductive process uses evidence to support a conclusion (Snape D & Spencer L 2005). This thesis was an explanatory mixed method study where the initial quantitative aspect (questionnaire survey) was based on 'behavioural change theory' where I already had a framework within which to work. Qualitative approach (using focus groups) was used to explain and get a deeper understanding of the findings of the quantitative research based on the framework and hence the data analysis was conducted using the Framework Approach developed for applied social research (Ritchie J & Lewis J 2005).

11.2.2 Conducting focus groups

It was my first experience of conducting focus groups. Although I had read quite a lot about conducting focus groups, it was a unique and challenging experience. I realised that conducting focus groups was not just a pleasant chat but needs the researcher's ability to multitask, to make sure that questions are asked to elicit the responses about the area of interest while not interfering too much while keeping the focus of the discussions within the time constraints. There were couple of occasions where I felt confused about when to interfere.

One such occasion was during the discussion about 'snacking' in the groups. I was very tempted to ask participants to clarify what they meant by 'snacking' but was not sure if I should interfere. Again, when discussions went out of focus, it was hard to decide when to interfere to bring them back to the task, lest I missed something 'relevant' that might follow from the 'irrelevant' topics.

Understanding the language used in some of the groups was challenging as I was not 'tuned' to the different accents used by the participants from different geographical areas. Similarly, coming from a medical background, I occasionally used scientific language unintentionally such as 'cardiovascular diseases' which some participants couldn't understand and needed to be clarified. This experience helped me to learn to use non-academic language in conducting focus groups.

11.2.3 Analysis of qualitative data

As a 'Behavioural Theory' was used to underpin the quantitative work, a Framework approach (Ritchie J & Lewis J 2005) was deemed an appropriate method to guide the analysis of the qualitative data. Again, having worked with a 'theoretical framework' in quantitative research, I found it very hard to open up to the 'inductive' approach to qualitative analysis with the themes that emerged. Initially, I restricted the 'themes' to fit into the

identified constructs of the 'Theory'. After the initial struggle to move away from the 'constructs', I went to the other extreme bringing out every 'code/idea' that emerged, which was too fragmented. After a fruitful discussion with my supervisor (a qualitative researcher), I grouped the themes logically to be presented. This process was very useful as it helped me to keep with the 'inductive nature' of qualitative research highlighting many other 'sub themes' to be presented in an explicit and logical manner, while keeping close to the 'theoretical framework'.

11.2.4 Contribution of qualitative research

The contribution qualitative research made to explain the questionnaire survey was invaluable. For example, the validated questions from the 'behavioural theory' used phrases such as 'doing physical activity is stressful/relaxing' or 'eating five a day is stupid/clever' to assess the attitude of young people towards physical activity and diet respectively. Although these were validated questions, at face value it seemed to me fairly 'incomprehensible'. However, during the focus groups it became clear that those terms were in fact informative. For example, young people felt that spending £5 to get three fruits and vegetables when they could buy a whole lot more for just a pound ....'was stupid'.

In another instance, when asked if the diet was healthy, one of the participants agreed that it was healthy but she went on to say that she used a lot of mayonnaise in her sandwiches and it was ok to eat a bar of chocolate/bag crisps as long as she knew she was going to have a healthy dinner..but she stir fried the vegetables in oil. Thinking back, my assumption is that this person, who really had some unhealthy behaviours, would have ticked the 'healthy' box in the questionnaire. Adding a qualitative aspect to the study allowed the participants to explain the context in detail, which in turn gave insight into their behaviour in the real world.

It was also incredible to see how the attitudes of young people changed/modified during the couple of hours of focus group discussions with peers. For example, in one of the inner city focus groups with young mums, a participant expressed her view that she was not bothered

about putting on weight. When this was challenged by another participant to say that becoming obese could hinder their quality of life with their children, the others agreed and said that they never thought about that until the focus groups. This brings into focus the reality of the 'real world situation', the constant changing environment and the responses of young people in that situation.

11.2.5 Time and Language

Qualitative analysis is very time consuming and labour intensive. I seriously underestimated the length of time that the qualitative analysis would require. Reading the transcripts repeatedly and coming up with different 'codes' every time it was read was very unnerving which was different from quantitative analysis which produces the same result every time I repeated the statistical test. Although it seemed very tedious at the beginning, as I did more reading of the transcripts I felt satisfied with the themes emerging. As part of the validation of identifying 'Themes', my supervisor read two transcripts to make sure all the themes were being identified. It was revealing that although we picked up on the same themes, the labels given by each of us were different probably because we come from different disciplines, public health and sociology respectively. For example, a quote "I just make sure that it (eating chocolate and cakes) is not too often" was coded as 'behavioural control' by one of us and 'coping mechanism' by the other.

11.2.6 Assumptions

Although I expected a variation in responses from different groups, some of my assumptions were challenged in the focus group discussions. Reading the literature and from experience, I assumed that young people would be easily influenced and persuaded by peers and it was surprising that the influence mainly came from parents and childhood experiences. I also felt that the discussion in the university and college groups were more articulated and 'prepared' while the groups in the community were more 'evolving' and interactive.

11.2.7 Focus groups vs Individual interviews

At the start of this thesis, acknowledging that obesity was a social problem that it is strongly influenced by environmental and social factors, it was decided to conduct focus groups to understand the behaviour of young people. As anticipated, it did create a social context and facilitated a fruitful discussion that brought out the factors that were influencing behaviour. This was quite effective, in this age group, given that they had used the opportunity and felt quite comfortable challenging each other's perspectives on healthy lifestyle and obesity. However, during some of the focus groups, sensitive issues were mentioned (for example, the relationship with parents among young people in inner city areas, feeling of loneliness and fear of obesity/death when drinking on their own). Given that the relationship with mothers had a major influence on their behaviour, as highlighted in previous focus groups, it would have been worth exploring the issues in-depth with those individuals. The highlighted issues were too sensitive to be discussed in a group situation but would have been possible with one-to-one interviews and I almost felt it was a lost opportunity.

In answering some of the questions regarding their diet or PA behaviour, young people sometimes replied "I dinna ken (I don't know)". A one-to-one interview would have given the opportunity to explore that answer a bit more by giving them the time and the space to explain. I felt that the answer "I dinna ken" was more to do with declining to discuss the subject further in a group rather than genuinely not knowing the answer.

In summary, the qualitative study provided an in-depth understanding of the lifestyle of young people by providing a clarification of the contexts in which the diet and physical activity behaviours occur or do not occur, in real life situations.

SECTION – 5

DISCUSSION

Chapter 12: Discussion of the findings, recommendations and implications

12.1 Discussion of the findings

This thesis used a mixed methods approach to investigate the lifestyle of young people as it seemed appropriate to address the research question as explained in the introduction chapter. The initial systematic review of effective weight loss interventions in this age group, identified possible effective interventions but these were short-term and with small sample sizes in specific groups of people in controlled environments. The mixed method study that explored this age group further, used both quantitative and qualitative approaches. The quantitative and qualitative components have been appropriately analysed separately as suggested in the literature (Creswell JW & Clark VLP 2011) and integrated in this chapter (Bryman A 2008). The key findings from both methods are presented below in Table 9.1.

Table 9.1 Key findings from quantitative and qualitative study

Section 3: Quantitative study	**Section 4: Qualitative study**
Health factors ***Overweight (15%) and Obesity (7%)*** Increasing with age and more in males ***Diet:*** Fruit and Vegetables (39.8%) Regular meal pattern (58.8%) Snacking low (33.3%); high (31.6%) - decreased with age ***PA:*** Active behaviour (28.1% - decrease with age) TV (7.5% > 4hours); Comp/games (13.9% > 4 hours – increased with age)	**Health Behaviour** ***Diet:*** Behaviour varied: Uni =healthy but LES=poor **Healthy eating phases** common, especially during stressful times Reasonably knowledgeable about diet Influence: **+ parents/childhood** experiences **Need to have variety** ***PA:*** Mostly moderate across all groups PA decreased with age. Few picked up new activities Influence: parents both **+ve and –ve** influence
Attitudes/SN/PBC: ***Diet:*** Positive attitudes (56-85%) SN: 83% missing; PBC not measured ***PA:*** Positive attitudes (20-66%) SN: 15% important, 63% Not important PBC: 33% high, 26% moderate	***Diet:*** not prepared to invest time and energy to cook healthy food, look for easy options even if unhealthy; need variety balanced diet, only organic/fresh healthy ***PA:*** working in gym was exercise, walking not exercise. Concerned about PA and future. Diet is easy to achieve, PA is harder
Intention: ***Diet***: 73% had intention to eat 5 a day ***PA:*** 64% strong intention	***Diet:*** Recognised and made changes ***PA:*** PA decreased with age. Intention not converted to behaviour due to barriers identified
Facilitators: ***Diet:*** Health (59%), appearance (58%),support (54%) ***PA:*** Health (85%), appearance (90%), **winning (55%) associated with men**	***Diet:*** **look better, feel great now**, concern for future is low. Mixed opinion about cost and taste. Support from family and friends and **skills to cook** is possible motivators ***PA:*** **Enjoy PA, felt better and able**, being good at things, company, **achievable goals, subsidised facilities** , **need excitement and buzz**
Barriers : ***Diet:*** Time (78%), Access (60%), money (56%) ***PA:*** Time (62%), money (57%), weather (41%)	***Diet:*** Stress (exams leading to lack of time and low mood). Easy access to unhealthy food and **lack of organising skill,** lack of facilities ***PA:*** student lifestyle, lack of company, time, cost. **Competitive sports is a discouragement**
Health promotion ***Diet:*** Information was useful (68%) ***PA:*** Lack of information was not a barrier (62%)	***PA Health promotion messages:*** Empty, not useful, should create buzz and excitement

12.1.1 Prevalence of overweight/obesity

The quantitative survey indicates that the self-reported prevalence of overweight and obesity amongst 18-25 year olds in Grampian population was 15% and 7% respectively and increased with age. These rates were lower than the overweight/obesity levels reported in general population of North East of Scotland (20-26%) (Butland B et al. 2007), other general population studies which reported results for a slightly wider age group (14% obesity in 18-29 year olds; self reported) (Mokdad et al. 2003) or those conducted as part of compulsory medical examination of army recruits (17% overweight in 18- 25 year olds; measured) (Saely et al. 2009). The self reported height and weight used in this study to calculate BMI could be a reason for lower OW/obesity levels. However, a validation study of self-reported body mass index among 18-25 old university students in Grampian, revealed a small under-reporting of body weight and a slightly over estimation of height, but only by men. These biases resulted in minor under-reporting of body mass index (BMI) of 0.80 kg/m^2 for men and 0.37 kg/m^2 for women in the18-25 year old age group showing that the overall impact on BMI was minimal (Aucott L et al. 2009), Appendix 8.4. The higher levels reported in these published studies could be probably due to the inclusion of adults who have already become obese or conducted in targeted captive populations. None-the-less, there is a concern that these levels of overweight/obesity over time are increasing in this age group and prevention is needed (Burke et al. 2004;Rasmussen, Johansson, & Hansen 1999;Stamatakis E 2005). In addition, the strong parental influences on young people's diet and physical activity behaviours highlights the need to modify the behaviour of this age group, given that they are potential parents themselves, to be responsible for their children.

The lack of participation of this particular age group generally in surveys and interventions may be another reason for lower levels of obesity reported in this age group. This thesis included a wide spectrum of 18 -25 year olds by including those not only in further and higher education, but also those in the community and NEET groups (not in education, employment or training). This study found higher levels of both overweight and obesity among males compared to females, similar to studies conducted in this age group (Burke et al. 2004) but

different to other studies reported in children and the under 20s age group (Butland B et al. 2007).

12.1.2 Lifestyle behaviours

Obesity relates mainly to energy imbalance, that is inadequate energy expenditure compared to the energy being consumed and is associated with a number of lifestyle behaviours such as diet and physical activity. While physiological, metabolic abnormalities and genetic factors account for some of the increased levels of obesity, these are unlikely to be changed (Allison DB & Faith MS 2000;Baranowski et al. 2003). Reports and guidelines (Butland B et al. 2007;SIGN 2010) recommend changes in diet, physical activity and behaviour at individual and community levels along with environmental changes, in order to reverse the obesity trend. Studies suggest that behavioural change is more likely to occur only when the mediating variables are strongly related to the behaviour of interest (Baranowski T 2006).

Diet and physical activity behaviours modelled on a well researched behavioural theory (TPB) (Baranowski et al. 2003) in the quantitative study, showed that positive attitudes and demographic factors (gender and employment status) account for 55% of the variation around the intention to eat healthily and to do adequate amounts of exercise. However, the translation of this intention into actual behaviour was poor for both diet and physical activity, as found in other studies (Baranowski T, Cullen K, & Baranowski J 1999;Gardner RE & Hausenblas HA 2005). For this study, by acknowledging the interaction between the individual's behaviour with cognitive factors and the environment, the addition of perceived barriers and facilitators to the statistical modelling improved the fit, more so for the physical activity behaviours than the diet behaviours.

12.1.3 Diet behaviour

Fruit and vegetable consumption seen in this survey was the better predictor for healthy eating followed by meal eating patterns and snacking. However, having regular meal patterns was the only diet behaviour significantly related to lower BMI. While regular meal

eating patterns were also associated with lower levels of snacking, the latter was not additionally informative to BMI. One third (33%) of young people in this study did not have regular breakfast compared with only 8% and 3% who skipped their lunch and dinners respectively. Fast food consumption and breakfast skipping have been seen to increase during the transition to adulthood and both of these behaviours are associated with weight gain (Niemeier et al. 2006). Previous studies in children have also shown that those who skipped breakfast had higher energy intake from snacks higher in fat, (Gordon-Larsen et al. 2004) probably due to hunger later in the day. This irregular eating and high snacking amongst young people could be due to increased independence along with added responsibility for obtaining food and its preparation. The qualitative study further revealed that consequently, young people seem to have phases of healthy/unhealthy eating often driven by various stresses such as exams and lack of time compounded by the lack of organising skills especially during those times. In spite of young people being reasonably knowledgeable about the consequences of an unhealthy diet, there were some misconceptions about what constituted a healthy diet (should be only organic or be fresh fruit and vegetables or freshly prepared) and the belief that healthy meant expensive. The first year of independent living at university and/or when first earning had a major influence on their unhealthy lifestyle, however, by about 20-21 years old, they seemed to realise that continuing with such an unhealthy diet is not viable which in turn initiates motivation for change in their diet.

12.1.4 Physical activity behaviour

Young people recognise the need to change their diet by the time they are about 20 years old. In contrast, the levels of physical activity continuously decreased with age. In this study, only 28% of 18-25 year olds were achieving the physical activity levels as recommended by the national guidelines. These levels are even lower than that reported in 2000 in England where, albeit amongst 16 -24 year olds, 58% of men and 32% of women achieved recommended levels (Department of Health 2000). A systematic review looking at descriptions by 11–16 year old girls of what it meant to *'become a woman'* suggests that

participating in physical activity was seen as *'babyish' (Rees et al. 2006)*. This attitude may be a contributing factor in the decreasing levels of physical activity levels among 18 -25 year old females seen in this study. In addition, time spent on computers/game consoles, whether for work/study or pleasure, increased gradually within this age group (12% to 20%).

The focus groups revealed that few did moderate to vigorous exercise and many did not pick up any new sport after moving to university or to a job or having children, in spite of being active at school. This could be because the physical activity is more organised in schools but becomes an individual's responsibility once they become independent. Certainly the transition from primary to secondary schools show declining levels of organised physical activity putting the responsibility onto the children, who even at 17 years of age complain of 'lack of time' and 'changing priorities or interests' (Belanger M et al. 2009). In addition, the lack of effort to do more exercise could also be because of perceptions that changing diet behaviour was the easier option and more important than doing more exercise, suggested by other studies in the 18-25 year old age group (Okonkwo O & While A 2010). This was also reflected in the more positive attitudes towards diet compared to physical activity. While most walked to university/shops, there was a misconception that walking was not adequate exercising. Consequently, many of the young people chose a sedentary lifestyle because they believed that the only way to exercise was to work out at a gym or to participate in organised sports. They perceived 'cost' as a barrier as they felt they did not have enough money to pay for the gym, to buy personal equipment or to pay for child care while they were at gym. However, some of the young people in inner city areas perceived that they already did enough exercise and did not feel the need to do more, which could be because of the attitude/belief that they might not become obese (Mullaney MI, Corish CA, & Loxley A 2008).

12.1.5 Relationship between lifestyle behaviours and obesity

Among 18 -25 year olds, while being physically active explained 1.5% of the BMI, regular meal eating pattern (diet behaviour) explained less than 1%. When considered together, diet and physical activity behaviours modelled along with demographic variables explained

around 4% of the overall BMI variation. While gender was important with respect to diet and physical activity behaviours individually, it did not have an influential effect on the final model for BMI prediction. Of the demographic factors, only age and employment status were included which alone explained 3% of the BMI. The increased levels of obesity in the older age group could be due to decreased levels of physical activity in combination with the delayed impact of higher levels of snacking when they were younger (18-19 year olds). Higher levels of obesity among students who were also employed could be possibly because they were not sufficiently organised to make meals but had enough money to buy a wide variety of cheap, energy dense, readymade food which was easily accessible and seen as an easy option.

12.1.6 Individual barriers

In spite of reasonable knowledge about healthy lifestyles and good intentions to eat healthy and do more exercise, young people were not able to translate these into actual behaviour. Perceived barriers stopping them from eating regularly and doing adequate amounts of exercise were mainly lack of time and organising skills during times of stress. Future health was not a concern for young people, although they did have an awareness of the consequences. This could be because, the consequences of an unhealthy diet and a sedentary lifestyle as a delayed occurrence leading to obesity and other morbidities (Hill et al. 2003) probably has no *'fear factor'* to encourage young people to change their behaviour.

This study also identified some issues specific to this age group. Although the qualitative study was not conducted to validate the quantitative findings, it has to be acknowledged that, in the quantitative study, competitive sports and winning was identified as a motivator for physical activity in 55% overall, and was more so for men. However, it was seen as a major discouragement for many in the focus group discussions. This could be because of fewer male participants in the focus group. Feelings of inadequacy and low self-esteem regarding their body image made walking into a gym or swimming pools with the opposite sex a barrier for females, mainly single mums. Studies have shown that those who feel low competence

and self esteem do not generally engage in physical activity (Fox KR & Hillsdon M 2007). Hence, improved facilities and activities focussed on single sex could motivate young women of this age group to participate in more physical activity. Friends have been seen to be an important social influence on young people's eating behaviour, albeit in 15 year olds (Salvy et al. 2011). However, pleasing or impressing other people was not an important influencing factor in these 18-25 year olds relating to diet or physical activity behaviour. Most said they would like to eat healthily to look/feel good and to participate in activities for fun rather than to win or impress other people.

Some of the factors such as time and cost, identified as barriers in this study have been highlighted previously among adults in the past 20 years (Dishman 1994). However, this study using both quantitative and qualitative methods, has clarified the dynamics of these occurrences in this age group. Although the cost of spending on healthy food or paying for organised sports and going to gym was mentioned repeatedly as barriers, the focus group discussions revealed that young people are willing to spend money on tasty food but need variety, whether it is a healthy or unhealthy diet. Further, they were willing to experiment with cooking given adequate cooking skills.

Having information on how to eat a healthy diet was deemed useful by 70% of these young people. While information about physical activity was not especially seen to be a facilitator for increasing levels of exercise and that the lack of information was not a barrier in 62%, the focus groups did reveal that young people felt that health promotion messages about physical activity were 'empty messages' not relevant to them. Concern for future health, depicted in many of these health messages, seemed irrelevant to the young people and did not have the necessary concepts to motivate them to do adequate amounts of exercise.

12.1.7 Societal barriers

In a recent study among university students (Okonkwo O & While A 2010), 97% expressed a view that the responsibility to tackle obesity lies with individuals while 64% and 55% felt it was the responsibility of the Government and the health care provider's respectively. However, during the focus group discussions, inadequate cooking facilities in the catering halls, the lack of healthy choices in canteens, the lack of equipment in the university gym and other such facilities for this age group in the inner city areas were highlighted by some young people in this study, indicating inadequate societal responsibility. Similarly, an Audit Commission report in 2006 found that two thirds of council facilities for physical activity in England were over 20 years old and in poor condition (Audit Commission 2006). Opportunities to access recreational facilities have been seen to be fewer for people in the most deprived areas (Fox KR & Hillsdon M 2007). Young people with a healthy lifestyle in this study felt they had little influence on the behaviour of others, perhaps pointing to the fact that motivation within the individual could be the key to success in changing behaviour with some help from the society. While there is an argument that it is the responsibility of the individual for tackling obesity, studies have argued that focusing on individual behaviour alone is unlikely to solve the problem of obesity(Chesney MA, Thurston RC, & Thomas KA 2001). As identified in the systematic review of this thesis, some interventions might lead to weight loss in some targeted motivated populations. Replicating these interventions at a community level is unlikely to succeed as only a fraction of young people will participate and among those, few will lose weight. Evidence has shown that these weight losses were not sustainable in the obesogenic environment in which we live. Individual responsibility can only have its full effect when they have access to a healthy lifestyle options (WHO 2011a). This can happen only in a society where government, private and voluntary sectors work together to change the societal and environmental factors, and support the individuals who want to make healthy choices (Huang et al. 2009;Swinburn B, Gill T, & Kumanyika S 2005;Yach et al. 2005).

12.1.8 Misconception about healthy lifestyles

In addition, young people also need to understand the concepts of a healthy lifestyle, that is the balanced act of both healthy eating (energy intake) and doing adequate amounts of exercise (energy expenditure) rather than focusing on one or the other. There seemed to be an inclination towards changes in diet behaviour rather than physical activity in this study, as also reported by other studies (Okonkwo O & While A 2010). This is compounded by the attitude and belief that physical activity can only be achieved by joining a gym and working out or participating in organised sports. This in turn leads to money being a barrier to pay for these activities. Educating young people to understand that walking and many other daily activities contribute towards sufficient levels of exercise and helping them to acquire adequate cooking skills to make tasty, healthy meals at a low cost might give them the confidence to change their behaviour.

12.1.9 Factors crucial to this age group

The young people in this study did report succumbing to mood, pressures of exams, impulsive decisions to eat unhealthily, having a *'can't be bothered'* attitude for both cooking and doing exercises and being easily distracted. However, they seemed to have a sense of '*balanced eating*' and had the potential to revert back to healthy diet if they recognise these shortcomings and were encouraged to manage them. In spite of the hurdles, betterment of appearance and 'feeling good' were factors that would motivate them to eat healthily rather than social pressures and concerns about their future health. To do sufficient exercise, they needed a sense of excitement and constant change in the type of exercise in which they participated. The inductive nature of the focus groups revealed that young people felt the health promotion messages on physical activity were empty and not useful and they should instead create buzz and excitement. However, young people seemed to seek the support of family/ partners to sustain a healthy lifestyle.

Small changes, homing in on the immediate benefits 'of feeling good' and 'looking better' and making it fun and exciting might be more likely to produce changes in behaviour rather than messages about future health and prescriptive 'rules'.

12.1.10 Small behavioural changes

Social change is slow and in the mean time, individuals must be helped to manage their behaviour better within the current environment (Hill et al. 2003). A set of individual interventions that produce only a modest effect on energy balance might make important contributions when combined as a broad programme in obesity prevention (Swinburn B, Gill T, & Kumanyika S 2005). The amount of behaviour change (change in energy expenditure relative to energy intake behaviour) required to attain the energy balance is estimated to be 100kcal/day to prevent weight gain in 90% of US adult population (Hill, Peters, & Wyatt 2009). An increase of approximately 2,500 steps per day, roughly translates into 100kcal/day (Stroebele et al. 2009). Similarly, taking a 3 - 4 less bites of food at each meal will reduce energy intake without giving up any favourite foods (Hill et al. 2003;Rodearmel et al. 2007;Stroebele et al. 2009). These short-term interventions state that small behaviour changes are more feasible to achieve and may be sufficient to prevent excess weight gain, albeit among adults.

12.2 Strengths of this study

12.2.1 The vulnerable age group

Early adulthood, in spite of being identified as one of the critical age groups for gaining weight due to changes in their social and environmental circumstances, is under researched. There have been a limited number of intervention studies for weight loss in this age group but these were conducted in strictly monitored experimental conditions with small sample sizes. In addition, population based longitudinal studies that have been conducted were either single sex (Ball, Brown, & Crawford 2002) or relatively small samples (n=569) (Burke et al. 2004). This study, in contrast, has specifically focused on understanding the lifestyle behaviours relating to obesity among the wide spectrum of 18 - 25 year olds in both sexes with a relatively large sample size (n=1313).

12.2.2 Hard to reach age group

Studies have identified young people between 16 to 25 year olds as a ‘hard to reach’ and the neglected group. Many studies that have attempted to study this age group acknowledged the challenge of recruiting from this age group and consequently, restricted their recruitment to just student populations studying sports or health related subjects (Lake et al. 2009). This has been recognised as biased (Okonkwo O & While A 2010) and their views could be different from the general population. This study made real attempts to recruit from the whole spectrum of young adults: those who were in higher and further education, those in the community and to incorporate those who were not in education, employment or training.

12.2.3 Mixed methods approach

Initially a systematic review was conducted to identify the existing evidence of effective interventions for obesity prevention in this age group and proved to be limited. Consequently, this study used both quantitative and qualitative methods to understand the lifestyle behaviour of young adults. While the quantitative study gave an overview of young people’s lifestyle, the focus group discussions provided explanations, greater depth and context. Each of the components were designed with appropriate sampling, data collection and analysis methods. For the survey, both electronic and hard copies of questionnaires were used to maximise the response rate. Again for the qualitative study, focus groups were recruited from university/college and community groups both in inner city areas and the shire. Findings from each of the components were integrated to answer the research questions.

12.2.4 Use of behavioural change theory

This study had a strong theoretical basis on which the quantitative questionnaire survey was based and informed the focus group guide to investigate the behaviour of young people. Appropriate behavioural change theory was identified by reviewing the literature and identifying theories on which previous studies were based, in this age group.

12.2.5 Multidisciplinary study

Obesity is a complex issue that needs a multidisciplinary approach to address the problem (Butland B et al. 2007). This thesis availed the expertise from various disciplines/sectors to conduct the research. The education sector (university and colleges) and Community Health Partnerships (CHPs) from the NHS health boards were involved in recruitment of a complete spectrum of participants. Advice from practitioners (CHP leads), psychologists, medical statisticians, sociologists was sought in designing the questionnaire survey and conduct of the focus groups.

12.3 Limitations of this study

12.3.1 Predictive power of the behavioural models

In spite of extensive research and effort into identifying an appropriate psychosocial model to base the lifestyle exploration, the constructs identified within these models had poor predictive power over the lifestyle behaviours. When modelled with the BMI, these mediator lifestyle behaviours (diet, physical activity and demographic factors) explained only a small proportion of BMI variance. Conceptualisation of these theories might be one of the reasons for this, where there could be other constructs/factors not yet identified by these models that might play a part in changing behaviours. In addition, measuring these 'constructs' with few selected questions might not provide the detailed answers to the mediating pathways of behaviour. Strictly using these theories might limit the opportunity to understand the complex behavioural patterns in young people. This was revealed during the qualitative part of this thesis, where the inductive nature of the discussion highlighted many more factors that affected the behavioural patterns of young people.

12.3.2 Recruitment and sample

For the questionnaire survey, in spite of many attempts, this study failed to specifically capture young people from work places due to lack of willingness of the major employers to participate. Although a random sample of the community was included, the sample size from the community was relatively small compared to the young people from further and higher

education. In addition, there could have been an overlap between the young people recruited through university/college and the community sample despite participants being asked to ignore the questionnaire if they had already completed it. Recruitment from universities and colleges was done through their respective registries since no direct access to students was permitted. Consequently, a global invitation was sent to students asking them to only complete the survey if they were aged between 18-25 years. There is an assumption that all those who filled in were within that age group although there is a possibility that some were out with the age group.

In spite of a large sample size (n=1313), this survey captured 26% of the males in the Grampian region. This gender split of the sample was not representative of the Scottish population, where there was an equal split (48% males and 52% females) (Registrar General for Scotland 2001). In terms of employment/education status, this study over represents the proportion of those in education (65%, n=1313) compared to the Scottish Health survey (The Scottish Government 2010b), (26%, n=1008 throughout Scotland). However, assuming the unemployed and the long term sick are classified as NEET groups, then this study sample is slightly under represented, capturing approximately 4% compared to 6-8% over the Grampian region (Mitchell RJ, Tod E, & McCartney G 2010).

12.3.3 Technology

Some respondents experienced problems with the online completion of the questionnaire. Some were logged out half way through and could not log back on to complete the process. Consequently, there were incomplete questionnaires which had to be excluded from the analysis reducing the sample size.

12.3.4 Questionnaire design

The way the fruit and vegetable eating behaviour (5 a day) question was phrased did not measure ‘portions’ but ‘number of times’. Consequently measuring consumption was based on an assumption that only one fruit or vegetable was eaten at a time. Although the concept

of ‘5 a day’ is universally used, no strict guideline is available on the combination of fruit and vegetable which constitutes ‘5 a day’ except the American guidelines which recommends three vegetables and two fruits (US Department of Agriculture 2010). So, ‘adequate amounts of fruit and vegetables’, were used here as equal amounts and fruit and vegetable (three fruit and three vegetables). In the amended questionnaire, although three diet behaviours (the number of times fruit and vegetables were eaten, meal patterns and snacking behaviour) were measured, attitudes were assessed only for fruit and vegetable eating. Therefore, all diet behaviours were modelled only on fruit and vegetable eating behaviour. PBC, one of the constructs of the TPB was not included for the assessment of diet behaviour.

It is worth noting that the variance in the physical activity was better predicted by the regression modelling than the diet behaviour. The possible explanation could be that young people are more confident about what constitutes an adequate physical activity with simple statement health messages (30min of moderate exercise 5-7 days a week), where as the dietary products and the combination of food items that constitutes a healthy diet are numerous and are confusing especially for young people. These simple conflicts in the health promotion messages could have had an effect on the response to questions relating to the behaviours, about the control over the behaviour and attitudes which in turn could have affected the predictive models

12.3.5 Self reporting

This study used a self reported questionnaire to explore young people’s lifestyle and did not measure any outcomes objectively. However, as discussed in the previous section, there is a good correlation between BMI calculated based on self reported height and weight measures and objective measurement of height and weight.

12.3.6 Focus groups

Some of the focus groups were conducted among preformed groups /friends and had fewer participants. On the one hand, depending on the relationship that pre-existed, this could have limited the free and honest expression of the feelings; on the other hand, being familiar with each other might have strengthened the interaction which is considered a major strength in a focus group discussion. In one focus group, the leaders were present during the discussion and it became apparent that one of them was the mother of one of the participants. This could have limited the participation and expression of feelings.

The focus groups were not (necessarily) conducted among the same cohort of young people who participated in the questionnaire survey to explain the results. Invitations to participate were sent out separately for the survey and focus groups. Although this can be seen as a limitation, it could also be perceived as strength, since no bias was introduced by pre-empting them with the questions from the survey. Using the same theoretical framework to develop the focus group guide would have brought out fresh discussion/ideas on the same issues from a different set of young people.

12.3.7 Alcohol and smoking

This thesis did not analyse the relationship between alcohol and smoking with obesity in any great detail. Although alcohol and smoking seem to be important components of a young people's lifestyle, here they were considered only as part of the demographic factors rather than as outcomes as highlighted earlier. This could have limited the understanding and is worth pursuing at a later stage.

12.4 Validation in mixed methods approach

Validation procedures in mixed methods study are still being developed. Various schools of thought have been put forward in the literature to address this issue. The current concept of 'validity', 'generalisability', 'reliability' and 'objectivity' defined in quantitative research paradigms, are viewed differently and are seen as inadequate by the qualitative researchers (Cutcliffe & McKenna 1999;Golafshani N 2003). As cited in study by Krefting (Krefting L

1991), the Guba's model proposed more acceptable equivalent terms for qualitative research: 'credibility', 'tranferability', 'dependability' and 'confirmability'. More recent schools of thought on validation in mixed research were: 1) addressing the specific types of validity checks to be conducted on both strands (Creswell JW & Clark VLP 2011) and 2) relating the validation to the stages in the process of research that might compromise the merging of the two strands of the study (Onwuegbuzie AJ & Johnson RB 2006). In this thesis, the validity checks were looked into for both the strands at their respective stages. The questionnaire used in the quantitative strand was based on previous questionnaires, published literature, input from experts in the field and included previously validated questions. This study had a relatively large sample size capturing the wide spectrum of 18-25 year olds. In the qualitative strand, the setting and participants of the study were clearly described, transcribing of the focus groups were double checked for accuracy, and identification of the themes were also extracted from a sample of the transcripts by one of my supervisors (AEC) for confirmability. Use of frame work analysis allowed for the transparency of the data management. At each stage of the research process, strategies were used to minimise the threats that might compromise merging of the data. Quantitative and qualitative samples were drawn from the same target population, although the focus groups were not necessarily conducted among the survey participants. This study used separate data collection procedures and the results were analysed and presented in an equal way providing the rationale for why one type of data provides a better understanding of the problem. Both the stands addressed the same research question based on the same theoretical underpinning. As suggested by Creswell (Creswell JW & Clark VLP 2011) this study constantly evaluated the overall objectives of the project, negotiating philosophical and methodological differences to achieve the aim of the study.

12.5 Future challenges

Based on the evidence from the literature and the mixed methods study which used both quantitative and qualitative approaches, this thesis was able to identify a few intervention components likely to be effective to improve and sustain a healthy lifestyle which would, in

turn, help prevent obesity in this age group. These include *'feeling good'*, '*appearance*', '*fun with buzz*' and '*skills for time management'*. However, there are many challenges and issues that still need addressing before developing an intervention.

Recruitment of young people to participate in any programme or intervention remains an issue. In spite of diligent approaches made, it was not easy to recruit a broad spectrum of representative young people. The lack of support from major employers was an issue in this study. This could be because obesity is not perceived to be a major issue in this age group at the moment, given that most are not obese. However, it is important to recognise that the effects of an unhealthy lifestyle are delayed, and ignoring this fact, will have major implications on the work force and economy, both to major employers and the country as a whole. Intervention components that with an '*excitement*' factor as suggested by young people in this study might encourage response from future participants.

The various components (diet, physical activity and demographic factors) explained only a small proportion of BMI variation. In spite of achieving a reasonably large sample size which included a relatively wide spectrum of young people, it is crucial to bear in mind that there could be other factors, not identified in this study, playing a part in this complex problem. However, with the increasing prevalence and severe consequences of obesity, it has to be worth developing such an intervention to address obesity prevention in this vulnerable age group. While some components to be addressed are common to both diet and PA (e.g. time management), some are specific to behaviours. Clearly, it would be a challenge to prioritise the testing of individual components. On the other hand, if considered altogether in an intervention, it might be difficult to identify and/or evaluate the effective components leading to changes unless carefully planned.

It is also crucial to identify the correct time to intervene as young people move from a more 'carefree' attitude at the 18 years old end of the spectrum to becoming more responsible by the time they are 25. Although this study indicates that around 21 years of age could be an

ideal time to intervene as it is when they begin to recognise the importance of a healthy lifestyle, it might be too late since they might by then be already showing signs of being overweight. Factors identified in this study might help catch the attention of younger people (18-19 year olds).

12.6 Recommendations

In spite of the limitations and challenges, effective approaches to produce and sustain small changes for the 18-25 year old age group need to be developed. From this investigation, potential intervention components most likely to be effective among young people to pursue a healthy lifestyle are:

Education component

- For both diet and PA, the perception of cost was a major barrier for behavioural change. Hence explaining 1) that meeting the recommended levels of PA can be achieved by active everyday living and 2) that the constituents of a healthy diet are not necessarily organic/made from scratch/just about '5 a day'.
- Improving awareness that both diet and PA are equally important for healthy living.

Health promotion component

- Focusing on 'here and now' messages rather than future consequences.
- Focusing on 'appearance', 'the feel good factor', PA as 'fun' and gives a 'buzz'.
- Encouraging the view of 'a balanced lifestyle' (energy intake vs energy output; managing the healthy/unhealthy eating phases).

Skills

- Opportunities to improve cooking skills to make tasty food that is easy and cheap.
- Skills to plan and organise time during stressful periods.

Social support

- Facilities/provisions tailored towards young people that have some level of excitement such as dancing along with a socialising element with friends.

- Increasing the provision of tasty food that is affordable while reducing the access to unhealthy food
- Support groups to sustain the active lifestyle

At the outset, the intention of this thesis was to identify the most effective components to develop a prototype intervention for this age group. However, this work has lead to multiple possibilities rather than a few neat and tidy components for an ideal intervention. In addition, it has also raised a dilemma and uncertainty in choosing from these identified components, as it is hard to ascertain the most important and/or efficacious elements. It has to be acknowledged, at this point, that obesity is a complex problem with multiple drivers, both individual and societal, which perhaps cannot be solved only by individually focussed interventions, even if they are most effective in an experimental situation. Until now, available interventions are proven to be effective in small controlled groups. However, population changes require consideration at both micro and macro environmental levels.

There is almost a blaming culture among the various sectors that has become a vicious cycle. Individuals blame the various sectors for not providing them with suitable environments for healthy lifestyle (cheaper unhealthy food, lack of healthy choices in canteens, lack of sports facilities) and the various sectors claiming that available resources are under used and customers wanting unhealthy choices like chips and chocolate to be available in the canteens. These obesogenic factors are not easy to change. Societal level interventions take time to put in place, and even longer before positive results are evident. In addition, in spite of being exposed to the same 'obesogenic environment', individuals/groups in the community hold different views, values, attitudes and develop different coping mechanisms in response to these forces, all crucial in driving individual behaviour.

Young adults at university and/or experiencing an independent lifestyle for the first time almost believe that it is a given time for them to 'enjoy', with no concern for a healthy lifestyle or future health. Capturing this group at this stage and identifying the motivating factors to stay healthy in an irresistible obesogenic environment would be ideal. This was the main

remit of this thesis and has been successful to a certain extent. For example, motivating young people towards a healthy lifestyle using the 'appearance' and 'having fun' factors using social events may be much more effective among this age group than the traditional health promotion messages such as avoiding disease and fear of future. Even so, developing the ideal intervention using these crucial factors may still not be effective unless young people are willing to participate. Hence the challenge about recruitment of this age group remains on how to engage these young people to take ownership in these programmes.

Given the obesogenic environment that individuals are being exposed to, there should be commitment of action from wide range of sectors. Small changes from every sector would be a better option to tackle obesity than focussing only on individuals. Efforts made by individuals towards maintaining healthy lifestyles and small changes by other sectors such as transport, education, trade and industry etc should be integrated and mutually encouraged. A constant subtle coming together by each party concerned might be more achievable towards prevention of obesity. In addition, each of these changes should be seen as complementary, rather than one replacing the other. A possible solution may be a central pivot that could orchestrate containable but integrated interventions such that a more holistic approach is achieved. Who or what this pivot might be, still needs to be explored.

12.7 Implications

This thesis has identified important intervention components relevant and crucial for this specific and vulnerable age group. In addition, it also highlights the challenges in developing an intervention. An intervention developed using these components, supported by policy and environmental changes, should bring about small incremental changes in young people's behaviour which in turn, gradually could have an impact on obesity prevention in this age group.

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PREVENTION OF OBESITY: EXPLORATION OF LIFESTYLE IN 18 – 25 YEAR OLDS

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APPENDICES

May 2011

APPENDICES

Appendix 1.1 Search strategy for Medline

1. exp Randomized Controlled Trials/
2. randomized controlled trial.pt.
3. controlled clinical trial.pt.
4. exp Random Allocation/
5. exp Double-Blind Method/
6. exp Single-Blind Method/
7. or/1-6
8. exp "Clinical Trial [Publication Type]"/
9. clinical trial.pt.
10. (clin$ adj25 trial$).ti,ab.
11. ((singl$ or doubl$ or trebl$ or trip$) adj25 (blind$ or mask$)).ti,ab.
12. placebos.sh.
13. placebo$.ti,ab.
14. random$.ti,ab.
15. exp Research Design/
16. research design.sh.
17. or/8-16
18. exp Intervention Studies/
19. 7 or 17 or 18
20. exp Obesity/
21. obese$.mp.
22. exp Overweight/
23. overweight$.mp.
24. or/20-23
25. (weight adj1 (loss or maint$ or reduc$ or control$) adj25 intervention$).tw.
26. (diet$ adj5 intervention$).tw.
27. (physical adj1 activit$ adj5 intervention$).tw.
28. exp Life Style/
29. ((lifestyle or life-style or life style) adj5 intervention$).tw.
30. exp Exercise/
31. (exercise$ adj5 intervention$).tw.
32. ((behaviour$ or behavior$) adj5 intervention$).tw.
33. or/25-32
34. 19 and 24 and 33
35. exp Pharmaceutical Preparations/
36. (drug$ adj5 intervention$).tw.
37. exp Bariatric Surgery/ or exp Surgery/

38. (surg$ adj5 intervention$).tw.
39. Prader-Willi Syndrome/ or Obesity Hypoventilation Syndrome/ or Polycystic Ovary Syndrome/ or Acquired Immunodeficiency Syndrome/ or Syndrome/ or Nephrotic Syndrome/ or Cushing Syndrome/
40. syndrome$.tw.
41. exp Contraceptives, Oral/
42. Leukemia/
43. (leukaemia$ or leukemia$).tw.
44. exp Neoplasms/
45. cancer$.tw.
46. exp Epilepsy/
47. exp Cystic Fibrosis/
48. exp Eating Disorders/
49. exp Anorexia Nervosa/ or exp Anorexia/
50. exp Bulimia Nervosa/ or exp Bulimia/
51. Anorexia.mp.
52. bulimia.mp.
53. (eating adj1 disorder$).mp.
54. or/35-53
55. 34 not 54
56. limit 55 to (''adolescent (13 to 18 years)'' or ''adult (19 to 44 years)'')
57. limit 56 to yr=''1980 - 2006''

Appendix 1.2 Data extraction form

Filter form

Bibliographic details

Authors: _____

_____ Year _____ Ref ID _____

Contact address: _____

Title: _____

_____

Journal: _____

Volume Issue Pages Country of publication

Reviewer1 _____ Reviewer 2 _____

Database: Medline Embase Cinahl PsychINFO

Others (e.g. reference checking, PhD)

Eligibility check

Criteria	**Yes**	**No**	**Unclear or others with details**
16-25 years (inc youth, young adults, College or University students)			
RCT or CCT or cohort with control group			
Life style intervention for obesity			

Yes ☐ No ☐

References ☐ Interesting ☐

Study characteristics

Study design	RCT	Quasi Randomised Trial or Controlled Clinical Trial	
Prevention or treatment			
Method of randomisation			

Study population baseline characteristics

	Control	**Intervention 1:**	**Intervention 2:**	**Intervention 3:**	**Intervention 4:**
Number of participants					
Age of participants					
Social class					
Ethnic group					
Setting					
Gender					
BMI category					

Details of interventions

	Control	**Intervention 1:**	**Intervention 2:**	**Intervention 3:**	**Intervention 4:**
Type of Intervention					
Description of intervention **Single/group**					
Who delivered intervention					
Who else involved					
Health professional involvement					
Duration of intervention and frequency of contact					

Outcomes and assessment

Outcome measured	**Measures:** BMI; Weight measure; Fitness **Behaviour:** Diet Physical Activity **Knowledge and Attitude** **Others**	Details:
Outcome evaluation: Measurement used	Self reported / observed measure	Detail:
Measurement of intervention effect:	Mean differences (95% CI) or Odds ratio (95% CI) Intervention 1 Intervention 2 Control **Baseline** **End of trial** **Follow-up** Others:	

Follow-up

% Drop out at the end of the study	Initial sample	Final sample	Details:
Was there a follow-up?	Yes		No
Duration of follow-up			Details:
Number of follow-ups			
% Drop out at the end of the follow-up	Initial sample	Final sample	Details:
Are losses to follow-up described?	Yes/No		Details:
Acceptability of study (Loss to follow-up, Success of study…)	Good/medium/poor		Details:
Any other issues arising:			

Overall methodological rating of the study

Quality of random allocation of concealment	2=adequate concealment of allocation	1=uncertain if adequately concealed or no description	0 = not adequately concealed or quasi randomised
Comparability of groups at baseline	2 = comparable	1= not mentioned	0= not comparable
Health care providers blinding	2=Blinding stated	1=Not mentioned or unclear	0 = Not blinded
Outcome assessors blind to intervention	2=Blinding stated	1=Not mentioned or unclear	0 = Not blinded
Follow-up time	2= More than a year	1 = Less than a year	0 = No follow-up (assessment at end of trial)
% Follow up (end of trial or at follow-up)	2= 60% or more	1= 40% - 59%	0 = Less than 40%
Dropouts details	2=States numbers and reasons for withdrawals	1=States withdrawal only but no numbers or reasons	0 = Not mentioned
Validated outcome measures used	2 =Yes	1 = Not clear	0=No
Reporting of outcomes	2 = Measured objectively	1= Self reported	0 =Not stated
Intention to treat analysis	2 =Yes	1 =Possibly, not clear	0 =No

Total score = 20

Strong > 15 ☐ Moderate 10 -15 ☐ Weak < 10 ☐

Conclusions:

Appendix 1.3 Conversion units

For the analysis, the units of measurement were standardised. All the values were converted from SI units to conventional units by dividing by the value in SI units by the conversion factor (http://www.unc.edu/~rowlett/units/scales/clinical_data.html) for each of the health outcome.

- Glucose was converted from mmol/L to mg/dl by dividing the given SI unit value by 0.0555
- Insulin was converted from pmol/L to µU/ml by dividing the given SI unit value by 6.945
- Maximum Oxygen Uptake ($VO2_{max}$) was converted from L/min to ml/kg/min by multiplying the value in L/min by 1000 and dividing it by the mean body weight.

Appendix 1.4 Results of exercise interventions as originally presented in the papers

Study 1

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Kim H-D et al 2006 Korea (Korean paper) CCT **Quality** Moderate	**Sample size** E: 20 C: 24 **Age:** Range 18-23 years **Sex :** All females	E: 60 minute Aerobic exercise 9 minutes warming up followed by main exercise for 45 minutes (30 minute aerobic exercise and 15 minute muscular strength exercise) and then a 6 minute cool down body movements. Intensity to maintain 60-80% of maximum heart rate. Maximum HR was gradually increased i.e. 1-2 weeks 60-65%, 3-4 weeks 65-70% and from 5 weeks gradually increased and maintained at 80%. Intensity measured by Karvonen's formula for HR C: No intervention with chance to participate later	Duration of exercise was 3-5 times a week for 12 weeks	Body weight (kg) BMI (kg/m^2) Body fat mass (kg) % Body fat Lean body mass (kg)	No baseline differences between groups; all values are Mean(SD) **E: Exercise** **C: No exercise** ***Sample size*** ***20*** ***24*** **Pre-test** **Post- test** **Pre-test** **Post- test** **F** **P value** Body weight(kg) 56.70(4.48) 55.60(4.20) 55.91(5.73) 56.46(5.72) 4.76 0.035 BMI 22.52(1.57) 22.38(1.76) 21.71(1.75) 21.91(1.77) 5.73 0.021 Body fat mass(kg) 19.60(2.85) 18.89(2.68) 18.61(3.06) 19.13(2.66) 5.68 0.022 % Body fat 34.47(3.01) 33.41(2.92) 33.17(2.69) 33.84(2.87) 2.91 0.095 Lean body mass(kg) 37.09(2.54) 37.40(2.93) 37.30(3.29) 37.27(4.08) 0.43 0.513 Comparison of post-test body composition in the experimental group and the control group by ANCOVA Covariate: pre-test each body composition

HR: Heart rate

Study 2

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Kondo T et al 2006 Japan Cohort with compared to a control group at the end **Quality** Moderate	**Sample size:** E: 8 C: 8 **Age:** Mean±sd E: 18.0±1.0 C: 18.0±1.5 **Sex :** All females	E: Aerobic exercise training programme Endurance exercises more than 30 minutes (30-60 minutes a day) four to five times per week. Fast slope walking, slope jogging, dumbbells, stretching, leg cycling and jumping rope. Exercise intensity was set at 60-70% HR reserve C: No intervention Estimated energy consumption was 400-500kcal	Duration was 7 months.	Body weight (kg) BMI(kg/m^2) Body fat mass (kg) % Body fat Lean body mass (kg) Total cholesterol HDL cholesterol Fasting plasma glucose (FPG) Insulin VO_{2max}	Significant baseline differences between groups in BMI and body weight (<0.01); % fat and lean body mass(<0.05); all values are Mean±sd ***Sample size*** **E: Obese *8*** **C: Normal *8*** **Pre-test / Post-test / P value / Pre-test / Post-test / P value** Body weight 72.5±6.9 / 64.5±4.1 / <0.05 / 55.0±2.3 / 53.2±2.5 / NS BMI 29.5±2.7 / 26.3±5.1 / <0.05 / 21.9±3.2 / 21.8±2.9 / NS Body fat mass 21.7±2.1 / 16.5±2.3 / <0.05 / 12.4±6.5 / 9.9±4.2 / <0.05 % Body fat 29.8±0.9 / 25.6±4.6 / <0.05 / 22.5±8.9 / 18.5±3.2 / <0.05 Lean body mass 50.3±4.9 / 48.2±8.5 / <0.05 / 42.5±4.9 / 43.5±3.2 / NS T choles 187±25.4 / 174.2±12.3 / NS / 140.5±15.5 / 121.5±12.1 / NS HDL chol 44.1±10.2 / 55.0±6.5 / <0.05 / 66.3±12.1 / 69.4±4.5 / NS FPG 95.6±8.6 / 90±10.2 / NS / 87.6±10.5 / 89.0±1.5 / NS Insulin 4.9±1.1 / 4.5±2.1 / NS / 4.3±1.2 / 4.1±2.5 / NS VO_{2max} 28.8±2.5 / 32.5±1.5 / <0.05 / 32.0±11.2 / 37.5±2.2 / <0.05 Student's Paired t-test was used

Total cholesterol and HDL cholesterol - mg/dL; Insulin- µU/ml; FPG mg/dL; VO_{2max} - Maximum oxygen uptake (ml/kg/min)

Study 3

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Hara T et al 2005 Japan RCT **Quality** Moderate	**Sample size:** E1: 7 E2: 7 C: 7 **Age:** Mean±sd E1: 19.7±1.3 E2: 18.4±0.5 C: 19.4±1.0 **Sex:** All males	E1: Aerobic exercise training(AE) Endurance exercise 3 times a week for more than 30 minutes (30-40 minutes) using treadmills and cycle ergometers E2: Aerobic+ resistance exercise training (AE+RE). Resistance training 2 or 3 times per week for 50 -60 minutes together with the aerobic exercise 3 times a week for 30 minutes. Resistance exercise included arm curl, triceps extension, shoulder press ups, squat, leg press and curl, bench press, trunk curl, lat pull down etc. 7 resistance exercise of choice C: No intervention	Duration was E1: 8 weeks of aerobic exercise. E2: 5 months C: contact at start and end of 5 months for samples and measurements.	Body weight (kg) BMI (kg/m^2) % Body fat Body fat mass(kg) Total cholesterol HDL cholesterol Blood glucose Insulin VO_{2max}	Paper reports no baseline differences between groups; all values are Mean±sd Alphabets is significant differences before and after intervention, a: p<0.05, b: p<0.01, and c: p<0.001 *Significant differences control vs aerobic exercises (p<0.05) ** Significant differences control vs aerobic and resistance exercise (p<0.05) # Aerobic vs aerobic and resistance exercise (p<0.05) at pre interventions Training effects on each variable was tested by Student's paired t-test

	E1: AE		E2: AE+RE		Control	
Sample size	***7***		**7**		**7**	
	Pre-test	**Post-test**	**Pre -test**	**Post-test**	**Pre-test**	**Post- test**
Weight (kg)	91.3±7.8	90.2±7.0	90.6±12.5	86.6±11.4[a]	98.1±20.2	96.0±19.6
BMI	29.9±1.8	29.6±1.7	29.9±3.8	28.6±2.8[a]	33.5±5.6	32.6±5.8
% Body fat	27.8±3.0	26.8±3.8	24.5±3.6	21.3±2.0[b]	29.3±3.8	30.3±3.0
Fat mass(kg)	25.5±4.5	24.3±5.0[a]	22.4±5.5	18.6±3.8[b]	28.6±9.1	29.3±8.2
T.cholesterol	164.7±31	172.9±36	153.4±23	165.8±14[a]	170±41	175.4±37.7
HDL choles	39.6±6.6	42.0±6.7	39.9±5.0	53.9±8.9[b]	38.9±9.7	42.3±8.6
Glucose	94.6±5.3	94.0±2.4	100.9±8.9	94.4±6.0[a]	105±14.9	100.3±9.0
Insulin	16.0±6.5	11.0±4.1	8.4±2.9**#	8.0±0.6	15.0±4.5	16.6±5.9
$VO_{2max,}$	30.1±6.4	31.3±5.9	30.4±4.6	40.5±1.6[c]	28.4±4.4	24.9±4.4

Total cholesterol and HDL cholesterol - mg/dL; Blood glucose - mg/dL; Insulin- µU/ml^{-1}; VO_{2max} - Maximum oxygen uptake (ml/kg/min)

Study 4

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Fernandez AC et al 2004 Brazil RCT **Quality -** Moderate	**Sample size:** E1: 10 E2: 9 C: 9 **Age:** Mean (se) E1: 16.7±1.5 E2:15.8±0.75 C:16±1.32 **Sex:** Only Males and obese	E1: Anaerobic exercise training. Interspaced training with series of cycle ergometer.25 watts x 0.8% of volunteer's body mass during 30 seconds with interval for active recovery (walking) for 3 minutes between series. 1st month: 11 series with pedal rotation speed above 80rmp/40 mins per session 2nd month: 14 series with increment of 10% on initial load/50 minutes per session 3rd month: 14 series, same load and same recovery time but 60 minutes per session E2: Aerobic training Cycle ergometer. Three times a week for initial period of 40 mins;2nd month 50 mins and 3rd month 60mins C: No intervention All three groups had nutritional orientation with consultation with nutritionist each month	Duration of 3 months with Nutritionist involved in the interventions No follow up	Body weight (kg) BMI(kg/m^2) Body fat mass (kg) % Body fat	No baseline differences between interventions and control groups; All results are averages ± standard deviations **E1** / ***Sample size 10*** / **E2** / ***9*** / **Control** / ***9*** **Pre-test** / **Post-test** / **Pre-test** / **Post-test** / **Pre-test** / **Post-test** Body mass(kg): 101±11 / 98±12* / 99±13 / 96± 13* / 98±14 / 94±14 BMI(kg/m^2): 33±3 / 31±3* / 33±3 / 32±3* / 33±3 / 33±4 Body fat mass (kg): 37.1±9.2 / 33.1±9.2* / 36.7±7.5 / 32.8±6.6* / 39.3±10.6 / 37.8± 10.6 % Body fat: 36.9±7.0 / 34.0±7.3* / 37.4±5.8 / 34.3±5.5* / 40.6±7.8 / 39.1± 7.5* * Differences between Initial and final evaluations(p<0.05); # differences in relation to control group(p<0.05) Between initial and final periods: paired t-test; Between groups: Two factor (time and group) ANOVA followed by Tukey test

E1- Anaerobic exercise group; E2- Aerobic group; C-control group

Study 5

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Mayo MJ 2002 Singapore Non-RCT **Quality –** weak	**Sample size:** E: 30 C: 30 **Age:** Mean (se) E: 19.7±0.6 C:19.2±1.3 **Sex:** Only males and obese	E: Aerobic exercise -Basic military training in armed forces Phase I (6 weeks) Gradual conditioning with emphasis given to physical training. Brisk walking over 4 weeks followed by endurance running Phase II (10 weeks) Combat skills training. Circuit training, games such as soccer and basketball, foot drills, individual field crafts, topography, assault course and combat shooting. Number of hours started with 10 hours per week progressing to 20 periods by the 12th week No dietary restriction was imposed during training or weekends at home. Usual servings in the Army consisted of 3066 Kcal/ per day(14% protein, 255 fat and 61% carbohydrates) C: No exercise. Only monitored	Duration of 4 months (780, one hour training periods) No follow up	Body weight (kg) BMI (kg/m^2) Fat mass (kg) % Body fat Fat free mass or Lean body mass (kg)	Significant baseline differences between groups: for body weight, BMI, Fat mass, % body fat controls were higher than test group. All values are mean±sd **Experiment** / **Control** ***Sample size*** ***30*** / ***30*** **Pre training** / **Post training** / **Pre training** / **Post training** Body weight(kg): 94.7±9.8 / 82.7±8.5*** / 101.2±13.4[a] / 102.3±13.6 BMI: 31.6±2.8 / 27.6±2.6*** / 34.1±4.0[a] / 34.4±4.1 Fat mass(kg): 28.3±4.7 / 17.0±4.1*** / 33.9±7.9[b] / 34.8±8.4* % Body fat: 29.7±2.6 / 20.6±3.3*** / 33.1±4.6[c] / 33.7±4.9* Fat free mass or Lean body mass (kg): 66.4±6.1 / 65.8±5.4 / 67.4±7.8 / 67.4±7.9 [a] p<0.05, [b] p<0.01, [c] p<0.001; pre comparisons between groups * p<0.01,***p<0.001; pre/post comparisons within each group Differences before and after training done by paired Student's t-test for each group

Study 6

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Schmidt WD et al 2001 USA Non-RCT **Quality** Moderate	**Sample size:** E1: 12 E2: 12 E3: 12 C: 12 **Age:** Mean ±sd E1: 20.7±2.5 E2: 18.3±0.48 E3: 19±0.93 C: 20.8±1.6 **Sex:** All females and obese	Designed such that there was a gradual increase of total minutes of Aerobic exercise per day 1-2 weeks, total duration of exercise was 15 mins. 3-4 weeks was 20 minutes and 30 mins from 5-12 weeks. Training at 75% of their heart rate reserve(HRR),± 5 beats per minute All subjects instructed to follow a self monitored calorie restricted diet (80% of REE) E1: 30 minute daily exercise group with one bout lasting 30 minutes (1x30) E2: A 30 minute daily accumulated exercise group with 2 bouts, each lasting 15 minutes (2x15) E3: 30 minute daily accumulated exercise group with three bouts each lasting 10 minutes (3x10) C: No exercise. Maintain normal activity routine	Duration was 12 weeks of aerobic exercise. 5 days a week Measurements conducted by research staff.	Body weight (kg) BMI (kg/m^2) VO_{2max} (L/min)	No baseline differences between groups. Values are mean difference± sd of difference **E1: 1x30 / E2: 2x15 / E3:3x10 / Control** **Sample size** 12 / 10 / 8 / 8 Body weight(kg) -2.7±1.1*** / -2.96±1.3*** / -4.36 ±2.3*** / 0.06 ±0.2 BMI (kg/m^2) -1.1±0.6*** / -1.1±0.4* ** / -1.6 ± 0.9*** / 0.0±0.09 Values are mean ± sd (only for baseline) **E1: 1x30** (12) **E2: 2x15** (10) **E3:3x10** (8) **Control** (8) **Pre (sd) / Post / Pre(sd) / Post / Pre (sd) / Post / Pre(sd) / Post** VO_{2max} (L/min) 1.72(0.04) / 1.92* / 1.75 (0.04) / 1.92* / 1.96(0.1) / 2.1* / 1.83(0.1) / 1.84 Sd for Post $VO_{2\,max}$ values were not given Repeated measures of ANOVA to analyse pre- and post treatment data followed by Tukey post hoc analysis when interaction was observed Changes from baseline to post-treatment significantly different from control group *** p<0.0001; ** p<0.01; * test stated significance but not level

VO_{2max} - Maximum oxygen uptake (L/min)

Study 7

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Eliakim A et al 2000 USA RCT **Quality -** Moderate	**Sample size:** E: 22 C: 22 **Age:** Mean (se) E: 16±0.7 C:16±0.7 **Sex:** Both sexes	E: Aerobic endurance exercise training. Involved running, aerobic dance, competitive sports like basket ball, occasional weight lifting varied in duration and intensity for maximum participation C: No exercise	Duration of 5 weeks 2-2.5 hours a day 5 days/week Interventions delivered by high school faculty No follow up	Body weight Total Cholesterol HDL Cholesterol	No baseline differences between the two groups; All values are mean±se **Experiment** / **Control** ***Sample size*** ***20*** / ***18*** **Pre-test** / **Post-test** / **Pre-test** / **Post -test** Body weight(kg): 61.0±1.8 / 61.8±2.0 / 66.2±3.5 / 66.8±3.3 Total Cholesterol (mg/dL): 133.1±9 / 135.3±9 / 137.4±5 / 139.7±8 HDL(mg/dL): 37.7±1.7 / 39.5±1.8* / 32.6±1.4 / 36.8±1.6* * pre vs post within groups, p<0.05 # for between group differences, p<0.05 ANOVA followed by modified t-tests by the method of Duncan for intergroup comparisons, if ANOVA was significant

Total cholesterol and HDL cholesterol - mg/dL

Study 8

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Raz I et al 1988 Israel RCT **Quality -** Moderate	**Sample size:** E: 28 C: 27 **Age:** Mean±sd E: 24.7±0.8 C:25.0±0.8 **Sex:** All males	E: Twice weekly supervised exercises and 60 minute self exercise once a week. -Each session had 5 minute warm up, 45 minutes work phase at 70-85% of maximum capacity determined by self measured pulse rate (3 times during exercise) and a 5 minute cooling period. - Exercises were either 45 minutes of jogging or 20 minutes jogging + 30minutes of aerobic circuit training i.e 6-8 exercises of 30 seconds of rope skipping, stair climbing, running or bouncing a ball) with 60 seconds of jogging between exercise C: No exercise **Not to change diet**	Duration of 9 weeks Interventions delivered by health supervisors No follow up	BMI HDL- C Fasting plasma glucose Insulin VO_{2max}	No baseline differences between the two groups in BMI but were significantly different in height and weight All values are mean±sd

	Exercise				**Control**			
Sample	***28***				***27***			
	Pre-test	**Post-test (9 weeks)**	**Diff**	*** p**	**Pre-test**	**Post-test (9 weeks)**	**Diff**	*** p**
BMI (kg/m^2)	22.6(2.3)	22.8(2.4)	0.2(0.43)	0.05	23.1(2.0)	23.3(2.3)	0.2(0.51)	0.05
HDL-C mg/dL	32.5(5.5)	33.8(5.6)	1.3(5.4)	0.25	31.1(4.8)	34.3(4.7)	3.2(4.9)	<0.01
Glucose (mmol/L)	8.84(0.47)	8.11(0.59)	0.52(0.69)	0.001	8.56(0.47)	8.36(0.59)	0.20(0.80)	0.19
Insulin µU/mL	9.08(3.79)	7.35(2.71)	1.72(2.97)	0.005	9.97(7.12)	8.98(5.82)	1.28(4.3)	0.14
VO_2 max (ml/kg/min)	38.6(7.9)	44.1(7.6)	5.5(5.7)	0.001	37.6(6.9)	37.8(7.1)	0.2(12.4)	0.86

Diff is the difference between baseline and nine weeks for the two groups

*Paired t-test for difference between baseline and nine weeks

HDL C- High Density Lipoproteins Cholesterol; Glucose – mmol/L; VO_{2max} - Maximum oxygen uptake

Appendix 1.5 Results of other interventions as originally presented in the papers

Study 1

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Leidy HJ et al 2007 USA **RCT** **Quality** - Strong	**Sample size:** E: 8 C: 4 **Age:** Mean ±se E: 20± 1 C: 20± 1 **Sex:** All females	**Combination (Diet and Exercise)** E: Diet and exercise intervention. Diet and energy deficit group to achieve negative energy balance -30% to -60%. For 3 months expected to eat 2 of the 3 week day meals at the research centre. Diet had 55% carbohydrates, 30% fat and 15% protein. Exercise was aerobic exercise 5 times per week at 70-80% of maximum heart rate as determined by maximal aerobic capacity. Exercise duration depended on achieving this. Total amount calories expended measured using OWNCAL feature. C: Non exercising and consumed enough calories to maintain weight by resting metabolic rate in combination with estimates of 24 energy expenditure assessed by triaxial accelerometer Other intake adjusted	Duration of 3 months. Exercise supervised by personal trainers. And food cooked at research health centre	Body weight (kg) BMI (kg/m^2) Fat mass (kg) % Body fat Fat free mass or Lean body mass (kg) $VO_{2\ max}$	Data expressed as mean± standard error

	Energy deficit			**Control**		
Sample	***8***			***4***		
	Pre-test	**Post-test**	**Change**	**Pre-test**	**Post-test**	**Change**
Weight (kg)	59.6±1.8*	57.1±1.9†	-2.5±0.9	52.9±0.5	51.6±1.2	-0.6±0.3
BMI(kg/m^2)	21.9±0.6	21.0±0.7†	-0.91±0.3	20.7±0.6	20.1±0.4	-0.24±0.1
Fat Mass (kg)	16.4±1.4	13.6±1.5†	-2.8±0.8*	12.8±1.5	12.1±1.1	-0.04±0.1
Body fat (%)	27.4±2.0	23.6±1.9†	-3.8±1.0*	24.2±2.8	23.3±2.3	-0.09±0.2
Fat free mass (kg)	43.2±1.5	43.5±1.1	0.3±0.7	40.1±1.6	39.5±1.6	-0.45±0.3
$VO_{2\ max}$ (ml/kg/min)	37.6±1.5	46.0±1.8†	8.26±1.8	36.2±5.3	37.9±0.8	1.8±4.0

* Control vs energy deficit group; two tailed Mann-Whitney U test ($p<0.05$)
† Pre- vs Post-study in energy deficit group; two tailed Wilcox test ($p<0.05$)

$VO_{2\ max}$ - Maximal oxygen uptake (ml/kg/min)

Study 2

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Eiben G et al 2006 Sweden RCT **Quality -** Strong	**Sample size:** E: 18 C: 22 **Age:** Mean (se) E: 22.7 (0.6); C: 22.3(0.6) **Sex:** All females Overweight participants	**Combination (Diet, Exercise and Behaviour)** E: Health Hunters: a package with 3 themes-physical activity, diet and behavioral skills for weight control. Initially face to face examination and counseling sessions followed by regular personalized contact via telephone/ e-mail or group sessions C: No intervention The control group received the pack after the intervention group	Duration of 1 year delivered by dieticians and support staff of the SOS trial	Body weight (kg) BMI(kg/m^2) % Body fat Lean body mass (kg)	No baseline differences between interventions and control groups; Values in mean (se) ***Change in body weight in kg*** **Experiment** **Control** **P value*** **n** **n** 1 -3.2(2.0) 14 2.6(1.9) 16 0.046 2 -1.6(2.3) 14 4.3(2.3) 16 0.047 3 -1.9(1.6) 18 2.6(1.4) 22 0.041 1= t-test; 2= ANOVA adjusted for baseline weight, smoking and age; 3= Intention to treat analysis * Differences in changes between the groups using two sample t-tests ***Changes in other indicators*** **Experiment** **Control** **P value*** ***Sample size*** ***14*** ***16*** BMI (kg/m^2) -1.3(0.75) 0.9(0.7) 0.046 Body fat % -3.0(1.4) 0.9(1.4) 0.063 Lean body mass (kg) 2.8(1.4) -0.8(1.3) 0.068 * Differences between groups using two sample t-tests

SOS: Swedish Obesity Study

Study 3

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Ames GE et al 2005 USA RCT **Quality** Moderate	**Sample size= 67** E: NR C: NR **Age:** Mean±sd E: 21.5±2.2 C: 21.5±2.2 **Sex:** All females	**Behavioural and motivational intervention** E: Reformulated Cognitive Behavioral Intervention **(RCB)**:20 sessions. 1- 10 sessions were SB intervention (see below) and 11-20 sessions was **RCB:** focused on realistic weight goals and expectations for weight loss, correcting faulty assumptions about appearance, valuing aspects of self unrelated to weight and fostering acceptance of weight and body shape. C: Standard Behavioral intervention **(SB)**- Group intervention: 20 sessions Restricted diet (1200-1500 kcal/day) and recommendation to exercise for 30 minutes at moderate to high intensity on 5 or more days per week. 2 supervised exercise sessions/week	20 sessions with 6 months follow-up	Weight(kg) Self esteem Beck Depression Inventory (BDI-II) Satisfaction (MBSRQ-BAS)	All values are Mean±sd

Sample size	**E: RCB *13***				**C:SB *13***			
	Baseline	**Phase 1 (10S)**	**Phase 2 (20S)**	**Phase 3-Follow up**	**Baseline**	**Phase 1 (10S)**	**Phase 2 (20S)**	**Phase 3 Follow up**
Weight (kg)	85.6±17	81.8±17	80.1±1[a]	81.7±6[b]	83.6±8	79.8±9	77.4±9[a]	79.9±9[b]
Self Esteem	21.8±5.6	19.6±4.9	16.1±6[d]	18.2±7.4	24.2±8.4	18.8±7.5	18.7±8.2	17.8±8[b]
BDI-II	9.3±7.1	5.8±5.4	3.6±3.9	4.5±6.1[b]	12.5±11	4.6±4.0	4.0±7.0	6.7±6.9[c]
MBSRQ-BAS	21.2±3.2	22.6±3.9	25.6±3[a]	23.3±4[c]	20.5±3.9	21.2±4.2	24.3±4[a]	24.1±5[b]
MBSRQ-AS	60.5±11.8	59.3±9.8	56.1±1.02	54.3±8.4[b]	60.0±10.9	60.1±9.8	58.1±11.7	56.1±12.0

[a] Significant within condition change from end of phase I to end of Phase II ($p<0.05$)
[b] Significant within condition change from Baseline to end of Phase III ($p<0.05$)
[c] Marginally significant within condition change from Baseline to end of Phase III ($p<0.05$)
[d] Significant between condition change from end of phase I to end of Phase II ($p<0.05$)

Repeated measures of 2 x 2 ANOVAs with time periods and two treatment conditions.

Phase I: End of first 10 weight loss sessions which was a run-in period identical for both groups with SB intervention; **Phase II:** End of 20 weight loss sessions where the experimental group received RCB and control group continued with SB intervention ; **Phase III:** At the end of the follow up(6 months)
Self Esteem: from Rosenberg Esteem scale (High scores indicate low levels of self esteem); BDI-II: Beck Depression Inventory –II; MBSRQ-BAS: Multidimensional body Self Relations Questionnaire- Body Areas Satisfaction Scale (Low scores indicate greater dissatisfaction); MBSRQ-AS: Multidimensional body Self Relations Questionnaire-Appearance Scale (High scores indicate greater dissatisfaction)

Study 4

<table>
<tr><th>Author & year and Type</th><th>Sample size & Age of participants</th><th>Intervention</th><th>Delivered by, duration & follow-up</th><th>Outcome measure</th><th>Results</th></tr>
<tr>
<td>Eyjolfson V et al
2004

Canada

CCT

Quality
Moderate</td>
<td>Sample size:
E: 10
C: 6

Age:
Mean(SEM)
E: 21.4(0.5)
C: 21.6(0.8)

Sex: Both sexes (12 females and 4 males)</td>
<td>Diet intervention

E: 4g of 75% Conjugated Linoleic Acid- CLA (35% cis-9,trans-11; 36.8% trans -10, cis-12) per day. To take one capsule with each of their meal and one with a light snack. Participants were asked to maintain their normal activity patterns during the 2 months

C: Placebo</td>
<td>8 weeks and no follow up</td>
<td>Body weight

BMI (kg/m^2)

% Body fat

Blood glucose (mM)

Fasting Insulin (pmol.L^{-1})</td>
<td>All values are presented as mean(SEM)
<table>
<tr><th></th><th>E: CLA</th><th></th><th>C: Placebo</th><th></th></tr>
<tr><th>Sample size</th><th>10</th><th></th><th>6</th><th></th></tr>
<tr><th></th><th>Pre-test</th><th>Post-test (8 week)</th><th>Pre-test</th><th>Post-test (8 week)</th></tr>
<tr><td>Body mass(kg)</td><td>74.2(3.0</td><td>74.8(2.8)</td><td>82.5(10.6)</td><td>84.5(10.9)</td></tr>
<tr><td>BMI (kg/m^2)</td><td>26.9(1.5)</td><td>27.1(1.5)</td><td>28.4(3.0)</td><td>29.1(3.1)</td></tr>
<tr><td>% Body fat</td><td>25.6(2.8)</td><td>26.4(3.0)</td><td>25.7(3.8)</td><td>26.5(4.3)</td></tr>
</table>
No significant changes in body mass, BMI or % body fat after 8 week of supplementation with either placebo or CLA
<table>
<tr><th></th><th>E: CLA</th><th></th><th></th><th>C: Placebo</th><th></th><th></th></tr>
<tr><th>Sample size</th><th>10</th><th></th><th></th><th>6</th><th></th><th></th></tr>
<tr><th></th><th>Pre-test</th><th>4 week</th><th>8week</th><th>Pre-test</th><th>4 week</th><th>8 week</th></tr>
<tr><td>Blood Glucose(mM)</td><td>4.1(0.2)</td><td>4.0(0.2)</td><td>4.0(0.2)</td><td>4.1(0.1)</td><td>4.2(0.2)</td><td>4.0(0.2)</td></tr>
<tr><td>Fasting Insulin (pmol.L^{-1})</td><td>119(14)</td><td>112(14)</td><td>84(7)[a]</td><td>107(21)</td><td>119(21)</td><td>105(21)</td></tr>
</table>
[a] Significantly different from baseline CLA ,p<0.05

Insulin Sensitivity Index (ISI) calculated from glucose and insulin: There was a significant improvement after 8 weeks of CLA supplementation but not at 4 week (p<0.05).
No Change in ISI in the placebo group.

Repeated measures of ANOVA (within each treatment) used to detect significant differences between 0,4 and 8 wks. Dunnett's posthoc test used to compare 4 and 8 wk to baseline</td>
</tr>
</table>

CLA: Conjugated Linoleic Acid; Blood Glucose(mM); Fasting Insulin (pmol.L^{-1})

Study 5

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Oka et al 1998 Japan (Japanese paper) RCT **Quality** Moderate	**Sample size:** E: 11 C: 11 **Age:** Mean(sd) E: 20.9(2.6) C: 20.0(0.0) **Sex:** All females	**Behavioural and motivational intervention** E: Motivation intervention to enhance self-efficacy and desire for weight control. Counselling (? Individual) asking participants to 1. specify the seasons for weight control 2. link these reasons to their "ikigai" (something that makes their life worth living; purpose or meaning of life) 3. perform self-monitoring by daily maintenance of diary on eating behaviour and general feeling about health C: Knowledge based. Group lectures by experienced nutritionist on food, body fat and correct diet Both groups were asked to perform weight loss through chewing methods: chew 30 times before swallowing. Advised to reduce snacks and alcohol but no further change to meal intake	Duration of 14 days 50 minute lecture or counselling at baseline and no contact during 14 days No follow-up Delivered by: Lecture by experienced nutritionist and counselling by counselor and 2 PG counselling students	Body weight (kg) % Body fat Self-efficacy (SE) in performing diet control Self-efficacy (SE) in controlling dietary behaviour Desire for weight control Network for supporting own dietary behaviour	No significant baseline differences between interventions and control groups except SE in controlling dietary behaviour (exp 2.00 Vs control 4.70; P<0.05) ; Values Mean±SD **Motivation intervention** / **Knowledge based (control)** / **P value ‡** ***Sample size*** ***10*** / ***6*** **Pre-test** / **Post-test** / **Pre-test** / **Post-test** SE in diet control: 1.20 / 4.44** / 1.00 / 0.33 (ns) / <0.005 SE in controlling dietary behaviour: 2.00 / 4.78** / 4.70 / 2.11* / <0.05 Desire for weight control: 1.60 / 2.00(ns) / 2.00 / 0.56*** / <0.05 Network for supporting own dietary behaviour: 12.1 / 14.0 (ns) / 12.9 / 13.5 (ns) / ns Change in body weight from baseline (kg): -1.36±0.79 / -1.06±0.93 / ns Change in % body fat from baseline: -0.54±0.95 / +0.20±1.00 / ns SE: Self Efficacy * difference between pre and post values within each group: * p<0.05; ** p< 0.01; *** p<0.005 ‡ Experiment Vs Control groups (Post intervention) SE in performing diet score: based on eight 3-point scales SE in controlling dietary behaviour score: Based on seven 3-point scale Desire for weight control: based on five 3-point scale Net work for supporting own dietary behaviour score: Based on nine 3-point scale Stats tests used were Mann-Whitney U and Wilcoxon tests (Japanese paper)

Study 6

Author & year and Type	Sample size & Age of participants	Intervention	Delivered by, duration & follow-up	Outcome measure	Results
Hazama T et al 1994 Japan Non RCT **Quality** Weak	**Sample size:** E: 10 C: 8 **Age:** Mean±sd E: 20.7±1.4 C: 20.9±1.7 **Sex:** All females	**Combination (Diet and Exercise)** E: Monitored exercise programme plus dietary advice. Supervised aerobic conditioning programme 4.2±1.3 days/week for 50 to 60 minutes per session. General advice on energy restriction of 25kcal/kg/day. Attend a 10-15 minute diet meeting once a week after exercise. Progress discussed at meeting with detailed advice on diet. C: No intervention	Duration of 15±1.8 weeks No follow-up	Body weight (kg) Body fat mass (kg) % Body fat Fat free weight or Lean body mass (kg) Total cholesterol HDL cholesterol VO_{2max}	No baseline differences between interventions and control groups ; all values expressed as mean ±SD

Sample size	**Experiment** ***10***		**Control** ***6***	
	Pre-test	**Post-test**	**Pre-test**	**Post-test**
Weight (kg)	64.6±3.8	60.2±3.6*	62.7±4.3	62.8±4.7
Body fat mass (kg)	21.7±3.0	17.5±3.1*	20.9±1.9	20.8±2.2
% Body fat	33.5±3.2	29.1±3.4*	33.3±1.8	33.2±2.1
Fat free weight or lean body mass (kg)	42.9±2.8	42.7±3.0	41.0±3.0	42.0±3.2
T cholesterol (mg/dL)	186.8±32.5	180.3±27.9	202.7±54.1	201.2±48.3
HDLcholesterol (mg/dL)	57.5±11.8	60.6±10.3	56.0±7.7	55.5±7.4
$VO_{2max,}$ (ml/kg/min)	32.0±4.4	36.2±4.3*	31.1±3.6	31.2±2.9

* Significant difference in paired t-test between pre and post mean values (p values <0.05)

Total cholesterol and HDL cholesterol - mg/dL; $VO_{2\ max}$ - Maximal oxygen uptake - ml/kg/min

Appendix 1.6 Results of exercise interventions as before and after comparisons

Author & year and Type	Intervention with Age and Sex of participants	Results				
Kim H-D et al 2006 Korea (Korean paper) RCT **Quality** Moderate	**Intervention:** Aerobic exercise **Age:** Range 18-23 years **Sex :** All females		**Pre-test mean (sd) (n=20)**	**Post- test mean (sd) (n=20)**	**Mean change (sd)**	
		Body weight (kg)	56.70 (4.48)	55.60 (4.20)	-1.10 (6.14)	
		BMI(kg/m^2)	22.52 (1.57)	22.38 (1.76)	-0.14 (2.36)	
		Body fat mass(kg)	19.60 (2.85)	18.89 (2.68)	-0.71 (3.91)	
		% Body fat	34.47 (3.01)	33.41 (2.92)	-1.06 (4.19)	
		Lean body mass(kg)	37.09 (2.54)	37.40 (2.93)	0.31 (3.88)	
		Mean change and the sd of the mean change was estimated				
Kondo T et al 2006 Japan Cohort study retrospectively compared to a control group **Quality** Moderate	**Intervention:** Aerobic exercise **Age:** Mean±sd E: 18.0±1.0 **Sex :** All obese females		**Pre-test mean (sd) (n=8)**	**Post-test mean (sd) (n=8)**	**Mean change (sd)**	**P value**
		Body weight (kg)	72.5 (6.9)	64.5 (4.1)	-8.00 (8.03)	<0.05
		BMI(kg/m^2)	29.5 (2.7)	26.3 (5.1)	-3.20 (5.77)	<0.05
		Body fat mass(kg)	21.7 (2.1)	16.5 (2.3)	-5.20 (3.11)	<0.05
		% Body fat	29.8 (0.9)	25.6 (4.6)	-4.20 (4.69)	<0.05
		Lean body mass (kg)	50.3 (4.9)	48.2 (8.5)	-2.10 (9.81)	<0.05
		T Cholesterol (m.mol/L)	4.84 (0.66)	4.51 (0.32)	-0.35 (0.73)	NS
		HDL Cholesterol (m.mol/L)	1.14(0.26)	1.42(0.17)	0.28 (0.31)	<0.05
		Fasting Plasma Glucose (m.mol/L)	5.31 (0.48)	4.99 (0.57)	-0.31 (0.74)	NS
		Insulin (pmol/L)	34.03 (7.63)	31.3(14.58)	-2.77(16.45)	NS
		$VO_{2\ max}$ (ml/kg/min)	28.8 (2.5)	32.5 (1.5)	3.70 (2.92)	<0.05
		Student's Paired t-test was used Mean change and the sd of the mean change was estimated				

Author & year and Type	Intervention with Age and Sex of participants	Results
Hara T et al 2005 Japan RCT **Quality** Moderate	**Intervention:** E1- Aerobic exercise E2- Aerobic exercise + Resistence exercise **Age:** Mean±sd E1: 19.7±1.3 E2: 18.4±0.5 **Sex:** All males	Paper reports no baseline differences between groups

	E1: Pre-test mean (sd) (n=7)	**E1: Post-test mean (sd) (n=7)**	**E1: Mean change (sd)**	**E2: Pre -test mean (sd) (n=7)**	**E2: Post-test mean (sd) (n=7)**	**E2: Mean change (sd)**
Body weight (kg)	91.3 (7.8)	90.2 (7.0)	-1.10 (10.48)	90.6 (12.5)	86.6 (11.4 [a])	-4.00 (16.92)
BMI (kg/m^2)	29.9 (1.8)	29.6 (1.7)	-0.30 (2.48)	29.9 (3.8)	28.6 2.8 [a])	-1.30 (4.72)
Fat mass(kg)	25.5 (4.5)	24.3 (5.0 [a])	-1.20 (6.73)	22.4 (5.5)	18.6 (3.8 [b])	-3.80 (6.69)
% body fat	27.8 (3.0)	26.8 (3.8)	-1.00 (4.84)	24.5 (3.6)	21.3 (2.0 [b])	-3.20 (4.12)
T.cholesterol (m.mol/L)	4.27(0.80)	4.48 (0.93)	0.21(1.26)	3.97(0.59)	4.29 (0.36 [a])	0.32 (0.71)
HDL cholesterol (m.mol/L)	1.03(0.17)	1.09(0.17)	0.06(0.24)	1.03(0.13)	1.39 (0.23 [b])	0.36 (0.26)
Bld Glucose (m.mol/L)	5.25 (0.29)	5.22(0.13)	-0.03 (0.32)	5.59 (0.49)	5.24(0.33 [a])	-0.36 (0.59)
Insulin (pmol/L)	111.1 (45.1)	76.39 (28.5)	-34.73 (53.40)	58.3(20.14#)	55.6(4.17)	-2.78 (20.56)
$VO_{2max,}$ (ml/kg/min)	30.1 (6.4)	31.3 (5.9)	1.20 (8.70)	30.4 (4.6)	40.5 (1.6 [c])	10.50 (4.87)

Alphabets is significant differences before and after intervention, a: $p<0.05$, b: $p<0.01$, and c: $p<0.001$
Aerobic vs Aerobic and resistance exercise ($p<0.05$) at pre interventions

Training effects on each variable was tested by Student's paired t-test

Mean change and the sd of the mean change was estimated

Author & year and Type	Intervention with Age and Sex of participants	Results
Fernandez AC et al 2004 Brazil RCT **Quality –** Moderate	**Intervention:** E1-Anaerobic exercise E2- Aerobic training **Age:** Mean±sd E1: 16.7±1.5 E2:15.8±0.75 **Sex:** Only males and obese	No baseline differences between interventions groups **E1: Pre-test mean (sd) (n=10)** / **E1: Post-test mean (sd) (n=10)** / **E1: Mean change (sd)** / **E2- Pre-test mean (sd) (n=9)** / **E2- Post-test mean (sd) (n=9)** / **E2-Mean change (sd)** Body weight(kg): 101 (11) / 98 (12*) / -3.00 (16.28) / 99 (13) / 96 (13*) / -3.00 (18.38) BMI(kg/m^2): 33 (3) / 31 (3*) / -2.00 (4.24) / 33 (3) / 32 (3*) / -1.00 (4.24) Body fat mass (kg): 37.1(9.2) / 33.1(9.2*) / -4.00 (13.01) / 36.7(7.5) / 32.8(6.6*) / -3.90 (9.99) % Body fat: 36.9(7.0) / 34.0(7.3*) / -2.90 (10.11) / 37.4(5.8) / 34.3(5.5*) / -3.10 (7.99) * Differences between Initial and final evaluations(p<0.05); Between initial and final periods: paired t-test Mean change and the sd of the mean change was estimated
Mayo MJ 2002 Singapore Non RCT **Quality –** weak	**Intervention:** Aerobic – Basic military training **Age:** Mean ±sd E: 19.7±0.6 **Sex:** Only males and obese	**Pre-test mean (sd) (n=30)** / **Post-test mean (sd) (n=30)** / **Mean change (sd)** Body weight(kg): 94.7 (9.8) / 82.7 (8.5***) / -12.00 (12.97) BMI (kg/m^2): 31.6 (2.8) / 27.6 (2.6***) / -4.00 (3.82) Fat mass(kg): 28.3 (4.7) / 17.0 (4.1***) / -11.30 (6.24) % Body fat: 29.7 (2.6) / 20.6 (3.3***) / -9.10 (4.20) Fat free mass or Lean body mass (kg): 66.4 (6.1) / 65.8 (5.4) / -0.60 (8.15) * p<0.01,***p<0.001; pre/post comparisons within the group: Differences before and after training done by paired Student's t-test Mean change and the sd of the mean change was estimated

<table>
<tr><th>Author & year and Type</th><th>Intervention with Age and Sex of participants</th><th>Results</th></tr>
<tr>
<td>Schmidt WD et al 2001

USA

Non-RCT

Quality
Moderate</td>
<td>Intervention:
Aerobic exercise with different durations
E1-1x30 min
E2-2x15 min
E3- 3x10 min

Age:
Mean ±sd
E1: 20.7±2.5
E2: 18.3±0.48
E3: 19±0.93

Sex: All females and obese</td>
<td>No baseline differences between groups

<table>
<tr><th></th><th>E1: 1x30
Mean diff (sd) (n=12)</th><th>E2: 2x15
Mean diff (sd) (n=10)</th><th>E3:3x10
Mean diff (sd) (n=8)</th></tr>
<tr><td>Bodyweight(kg)</td><td>-2.7 (1.1)</td><td>-2.96 (1.3)</td><td>-4.36 (2.3)</td></tr>
<tr><td>BMI (kg/m^2)</td><td>-1.1 (0.6)</td><td>-1.1 (0.4)</td><td>-1.6 (0.9)</td></tr>
</table>
For Body weight and BMI, mean difference and Sds' of the difference were given.

<table>
<tr><th></th><th>E1: Pre-test mean (sd) (n=12)</th><th>E1: Post-test mean (sd) (n=12)</th><th>E1: Mean change (sd)</th><th>E2: Pre-test mean (sd) (n=12)</th><th>E2: Post-test mean (sd) (n=10)</th><th>E2: Mean change (sd)</th><th>E3: Pre-test mean (sd) (n=12)</th><th>E3: Post-test mean (sd) (n=8)</th><th>E3: Mean change (sd)</th></tr>
<tr><td>VO_{2max} (ml/kg/min)</td><td>21.08 (0.490)</td><td>23.53 (0.572)</td><td>2.45 (0.75)</td><td>20.91 (0.478)</td><td>22.94 (0.558)</td><td>2.03 (0.73)</td><td>22.32 (1.139)</td><td>23.92 (1.367)</td><td>1.59 (1.78)</td></tr>
</table>
For $VO_{2max,}$ baseline and post intervention values were given with the sd's only for the baseline value. The sd for the post $VO_{2max,}$ was estimated from the graphs. In addition, the Values for $VO_{2\ max}$ were converted from L/min to ml/kg/min using the formula: value in L/min x1000 and divided by the body weight in kgs
Mean change and the sd of the mean change for VO_{2max} was estimated</td>
</tr>
<tr>
<td>Eliakim A et al 2000

USA

RCT

Quality -
Moderate</td>
<td>Intervention
Aerobic endurance training

Age:
Mean ±sd
E: 16±3.3

Sex: Both sexes</td>
<td>
<table>
<tr><th></th><th>Pre-test mean (sd) (n=22)</th><th>Post-test mean (sd) (n=20)</th><th>Mean change(sd)</th></tr>
<tr><td>Body weight(kg)</td><td>61.0 (8.44)</td><td>61.8 (9.381)</td><td>0.80 (12.62)</td></tr>
<tr><td>Cholesterol (m.mol/L)</td><td>3.45 (1.09)</td><td>3.50 (1.09)</td><td>0.05(1.55)</td></tr>
<tr><td>HDL cholesterol (m.mol/L)</td><td>0.98 (0.21)</td><td>1.02 (0.22)</td><td>0.04(0.30)</td></tr>
</table>
* pre Vs post within groups, p<0.05
ANOVA followed by modified t-tests by the method of Duncan for intergroup comparisons, if ANOVA was significant sds' were calculated from the SEs given in the paper. Mean change and the sd of the mean change was estimated</td>
</tr>
</table>

Author & year and Type	Intervention with Age and Sex of participants	Results				
Raz I et al 1988 Israel RCT **Quality -** Moderate	**Intervention** Aerobic exercise **Age:** Mean±sd E: 24.7±0.8 **Sex:** All males		**Pre-test mean (sd) (n=28)**	**Post-test (9 weeks) mean (sd) (n=28)**	**Mean change (sd)**	*** p**
		Body weight			0.62 (1.33)	
		BMI (kg/m^2)	22.6 (2.3)	22.8 (2.4)	0.2(0.43)	0.05
		HDL cholesterol (m.mol/L)	0.84 (0.14)	0.88 (0.15)	0.03(0.14)	0.25
		Glucose (m.mol/L)	8.84 (0.47)	8.11(0.59)	0.54 (0.69)	0.001
		Insulin (pmol/L)	63.06 (26.32)	51.05(18.82)	11.95(20.63)	0.005
		$VO_{2\ max}$ (ml/kg/min)	38.6(7.9)	44.1 (7.6)	5.5(5.7)	0.001
		* Paired t-test for difference between baseline and nine weeks Values for glucose were converted from mmol/l to mg/dL by dividing by the conversion factor (0.0555) Mean change in weight and the Sd of the weight change was calculated from BMI and given mean height of the participants				

RCT- Randomised controlled trials; CCTs- Trials where randomisation was done by birth dates or alternate allocation to group etc; Non- RCT: Trials but not randomly allocated or studies where it was not clear how they were allocated to the groups; Cohort with control group - cohort study with a control group at the end of the study for comparison

Appendix 1.7 Results of other interventions as before and after comparisons

Author & year and Type	Intervention with Age and Sex of participants	Results
Leidy HJ et al 2007 USA RCT **Quality -** Strong	**Intervention: Combination** Diet and aerobic exercise **Age:** Mean ±sd E: 20± 3.9 **Sex:** All females	**Pre-test mean (sd) (n=8)** / **Post-test mean(sd) (n=8)** / **Mean change (sd)** Body weight (kg): 59.60 (5.09) / 57.10 (5.37) / -2.50 (2.55) BMI(kg/m^2): 21.9 (1.69) / 21.0 (1.98) / -0.91 (0.85) Fat Mass (kg): 16.4 (3.96) / 13.6 (4.24) / -2.8 (2.26) % Body fat: 27.4 (5.66) / 23.6 (5.37) / -3.8 (2.83) Fat free mass(kg): 43.2 (4.24) / 43.5 (3.11) / 0.3 (1.98) VO_2 max (ml/kg/min): 37.6 (4.24) / 46.0 (5.09) / 8.26 (5.09) $V_{02\ max}$ Maximal oxygen uptake † Pre- vs Post-study in energy deficit group; two tailed Wilcox test ($p<0.05$) sds' were calculated from the SEs given in the paper.
Eiben G et al 2006 Sweden RCT **Quality -** Strong	**Intervention: Combination** Diet, physical activity and behavioural skills **Age:** Mean ±sd E: 22.7 ±2.5 **Sex:** All females Overweight participants	**Pre-test mean (sd) (n=18) (post n=14)** / **Mean change (sd)** Body weight (kg): 79.6(14.43) / -3.2 (7.483) BMI (kg/m^2): 28.1 (5.94) / -1.3 (2.81) % Body fat: 40.8 (8.91) / -3.0 (5.24) Lean body Mass (kg): NR / 2.8 (5.24) sds' were calculated from the SEs given in the paper.

Author & year and Type	Intervention with Age and Sex of participants	Results
Ames GE et al 2005) USA (PILOT STUDY) RCT **Quality** Moderate	**Intervention: Behavioural** E1 Reformulated Cognitive Behavioural intervention E2: Standard Behavioural Intervention **Age:** Mean±sd E: 21.5±2.2 **Sex:** All females	**E1: Pre-test mean (sd) (n=14)** / **E1: Post-test mean (sd) (n=13)** / **E1: Mean change (sd)** / **P value** / **E2- Pre-test mean (sd) (n=14)** / **E2- Post-test mean (sd) (n=13)** / **E2-Mean change (sd)** / **P vlaue** Body weight(kg): 85.6 (16.5) / 81.7 (6.1) / -3.80 (3.9) / <0.05 / 83.6 (8.4) / 79.9 (9.5) / -3.80 (5.00) / <0.05 Self Esteem: 21.8 (5.6) / 18.2 (7.4) / -3.60 (9.28) / NS / 24.2 (8.4) / 17.8 (8.2) / -6.40 (11.74) / <0.05 BDI-II: 9.3 (7.1) / 4.5 (6.1) / -4.80 (9.36) / <0.05 / 12.5 (11.0) / 6.7 (6.9) / -5.80 (12.98) / <0.08 MBSRQ-BAS: 21.2 (3.2) / 23.3 (4.2) / 2.10 (5.28) / <0.08 / 20.5(3.9) / 24.1 (4.6) / 3.60 (6.03) / <0.05 MBSRQ-AS: 60.5 (11.8) / 54.3 (8.4) / -6.20 (14.48) / <0.05 / 60.0 (10.9) / 56.1(12.0) / -3.90 (16.21) / NS Post -test mean is end of 6 months follow up ; Repeated measures of 2 x 2 ANOVAs with time periods and two treatment conditions Self Esteem: from Rosenberg Esteem scale (High scores indicate low levels of self esteem); BDI-II: Beck Depression Inventory –II; MBSRQ-BAS: Multidimensional body Self Relations Questionnaire- Body Areas Satisfaction Scale (Low scores indicate greater dissatisfaction); MBSRQ-AS: Multidimensional body Self Relations Questionnaire- Appearance Scale (High scores indicate greater dissatisfaction) Apart from body weight, the mean change and the sd of the mean change was estimated
Eyjolfson V et al 2004 Canada CCT **Quality** Moderate	**Intervention: Conjugated Linoleic Acid** **Age:** Mean±sd E: 21.4 ±1.6 **Sex:** Both sexes (12 Females and 4 Males)	All values are presented as mean(SEM) **Pre-test mean (sd) (n=10)** / **Post-test mean (8 weeks) (sd) (n=10)** / **Mean change (sd)** / **P value** Body mass(kg): 74.2 (9.49) / 74.8 (8.85) / 0.60 (12.98) / NS BMI (kg/m^2): 26.9 (4.74) / 27.1(4.74) / 0.20 (6.71) / NS % Body fat: 25.6 (8.85) / 26.4 (9.49) / 0.80 (12.98) / NS Blood glucose(m.mol/L): 4.09 (0.63) / 3.99(0.63) / -0.09 (0.89) / NS Fasting Insulin (pmol/L): 118.96(44.24) / 83.96 (22.15) / -35.00 (49.52) / <0.05 Values for glucose were converted from mmol/l to mg/dL by dividing by the conversion factor (0.0555) Values for insulin were converted from pmol/L to (µU/L) by dividing by the conversion factor (6.945) sds' were calculated from the SEs given in the paper

Author & year and Type	Intervention with Age and Sex of participants	Results
Oka et al 1998 Japan (Japanese paper) RCT **Quality** Moderate	**Intervention: Behavioural** E1: Motivation intervention-Enhanced Self Efficacy (SE) E2: Knowledge based-lecture **Age:** Mean±sd E: 20.9±2.6 **Sex:** All females	**E1: Pre-test mean (sd) (n=11)** / **E1: Post-test mean (sd) (n=10)** / **Mean Change (sd)** / **E2: Pre-test mean (sd) (n=11)** / **E2: Post-test mean (sd) (n=9)** / **Mean Change (sd)** Body weight (kg): 57.9 (9.8) / NR / -1.36 (0.79) / 57.8 (6.8) / NR / -1.06 (0.93) % Body fat: 29.3 (6.8) / NR / -0.54(0.95) / 27.9 (5.2) / NR / 0.20 (1.00) SE in diet control: 1.20 / 4.44** / 3.24 / 1.00 / 0.33 / -0.67 SE in controlling dietary behaviour: 2.00 / 4.78** / 2.78 / 4.70 / 2.11* / -2.59 Desire for weight control: 1.60 / 2.00 / 0.40 / 2.00 / 0.56*** / -1.44 Network for supporting own dietary behaviour: 12.1 / 14.0 / 1.90 / 12.9 / 13.5 / 0.60 SE: Self Efficacy; NR: Not reported * difference between pre and post values within each group: * p<0.05; ** p< 0.01; *** p<0.005 SE in performing diet score: based on eight 3-point scales (very confident, confident and not confident): SE in controlling dietary behaviour score: Based on seven 3-point scale ; Desire for weight control: based on five 3-point scale ; Net work for supporting own dietary behaviour score: Based on nine 3-point scale Stats tests used were Mann-Whitney U and Wilcoxon tests (Japanese Paper); For Self efficacy outcomes mean change was estimated
Hazama T et al 1994 Japan Non RCT **Quality** Weak	**Intervention: Combination** E- Monitored exercise program plus dietary advice: 10 **Age:** Mean±sd E: 20.7±1.4 **Sex:** All females	**Pre-test mean (sd) (n=10)** / **Post-test mean (sd) (n=10)** / **Mean Change (sd)** / **P value** Weight(kg): 64.6 (3.8) / 60.2 (3.6) / -4.40 (5.23) / <0.05 Fat mass (kg): 21.7 (3.0) / 17.5 (3.1) / -4.20 (4.31) / <0.05 % Body fat: 33.5 (3.2) / 29.1 (3.4) / -4.40 (4.67) / <0.05 Fat free weight or Lean body mass (kgs): 42.9 (2.8) / 42.7 (3.0) / -0.20 (4.10) / NS Cholesterol(m.mol/L): 4.84(0.84) / 4.67(0.72) / -0.17 (1.11) / NS HDL cholesterol (m.mol/L): 1.49(0.31) / 1.57(0.27) / 0.07 (0.41) / NS $VO_{2max,}$ (ml/kg/min): 32.0 (4.4) / 36.2 (4.3) / 4.20 (6.15) / <0.05 Mean change and the sd of the mean change was estimated

RCT- Randomised controlled trials; CCTs- Trials where randomisation was done by birth dates or alternate allocation to group etc; Non- RCT: Trials but not randomly allocated or studies where it was not clear how they were allocated to the groups; Cohort with control group - cohort study with a control group at the end of the study for comparison

SE – Self Efficacy

Appendix 2.1 Search strategy for health behaviour theories in young people

1. Psychological adj1 theor$.tw
2. Health adj1 behaviour$ adj1 theor$.tw
3. Health adj1 behavior$ adj1 theor$.tw
4. Or/ 1-3
5. Young adj1 people. tw
6. Youth.tw
7. Or/ 5-6
8. Obesity/
9. Over weight.tw
10. Or/8-9
11. 4 and 7
12. 4 and 10

Appendix 2.2 Original lifestyle survey questionnaire (2001)

‘Examples’ - Here are some examples, to show you how to complete or answer the questions:

A During the last year, how many times have you been admitted to hospital?
(Please tick one box only)

☐ 1 Never
☐ 2 Once or twice
✓ 3 Between three and five times
☐ 4 More than five times

B In each of the last 7 days, how many hours did you spend studying the following?
(*Please put a number in each space provided)*

	MON	TUE	WED	THUR	FRI	SAT	SUN
English		4			2		
Maths			2	3		2	

C How often do you do any of the following? (*Please tick one box for each option*)

		Never or rarely	1-2 times a week	3-5 times a week	6-7 times a week	Every day
Swimming	☐ 1	☐ 2	✓3	☐ 4	☐ 5	
Cinema	☐ 1	✓ 2	☐ 3	☐ 4	☐ 5	
Roller-skating	✓ 1	☐ 2	☐ 3	☐ 4	☐ 5	

END OF EXAMPLES
PLEASE START COMPLETING QUESTIONNAIRE

GENERAL

1. What year are you in at school?

   Year . . . . . .

2. Are you: *(Please tick one box only)*

   ☐ 1 Male
   ☐ 2 Female

3. How old are you?

   . . . . . Years

4. Are you: *(Please tick one box only)*

White	☐ 1	Black-African	☐ 5
Chinese	☐ 2	Black-Caribbean	☐ 6
Indian	☐ 3	Pakistani	☐ 7
Bangladeshi	☐ 4	Other	☐ 8

5. How tall are you?

   . . . . . metres . . . . . cm

   or

   . . . . . feet . . . . . inches

6. What weight are you?

   . . . . . kg . . . . . grams

   or

   . . . . . stones . . . . . lbs

7. On average, how much money do you have available to you each week? (Include lunch money, pocket money, wages etc) (*Please tick one box only*)

☐ 1 Up to £5
☐ 2 £5+ to £10
☐ 3 £10+ to £15
☐ 4 £15+ to £20
☐ 5 £20+ to £25
☐ 6 More than £25

8. If you know your postcode, please print the first five digits in the boxes below.

eg A B 2 3 6
☐☐☐☐ ☐

9. Which doctor's practice do you attend?

_____

HEALTH

10. In general, would you say your health is: *(Please tick one box only)*

- ☐ 1 Very good
- ☐ 2 Good
- ☐ 3 Average
- ☐ 4 Poor
- ☐ 5 Very poor

11. Do you have any long term illness or disability? *(Please tick one box only)*

- ☐1 Yes
- ☐ 2 No

If **'Yes'**, please give details .....

12. Do you feel: *(Please tick yes or no for each option)*

	Yes	**No**
Overweight	☐ 1	☐2
Underweight	☐ 1	☐2
Happy with your body	☐ 1	☐2
Fit and healthy	☐ 1	☐2
Worried about gaining weight	☐ 1	☐2
Unhappy if you eat too much	☐ 1	☐2
You eat a well balanced diet	☐ 1	☐2

13. Over the last year, have you tried to: *(Please tick Yes or No)*

	Yes	**No**
Take more exercise	☐ 1	☐2
Change your diet	☐ 1	☐2
Relax more often	☐ 1	☐2
Get a good night's sleep	☐ 1	☐2

14. How often do you feel under stress? (*Please tick one box only*)

Continually	☐1
Frequently	☐2
Occasionally	☐3
Never	☐4

DENTAL HEALTH

15. Are you registered with a dentist? *(Please tick one box only)*

Yes	☐1
No	☐ 2
Don't know	☐ 3

16. When did you last attend a dentist for a check-up? *(Please tick one box only)*

Within the last 6 months	☐ 1
7-12 months ago	☐ 2
Between 1 and 2 years ago	☐ 3
More than 2 but less than 5 years ago	☐ 4
5 or more years ago	☐ 5

17. Do you take any of the following steps each **day** to improve your dental health? *(Please tick Yes or No)*

	Yes	**No**
Use dental floss	☐ 1	☐2
Use a fluoride toothpaste	☐ 1	☐2
Brush your teeth	☐ 1	☐2
Take fluoride supplements (eg. Fluoride tablets)	☐ 1	☐2
Use a mouthwash	☐ 1	☐2
Use something else to prevent problems	☐ 1	☐2
Avoid having sugary foods or drinks in-between meals	☐ 1	☐2

If you use some other preventive measure, please give details .....

SKIN CARE

18. During the last 12 months have you had sunburn causing redness and soreness of the skin, that lasted for at least one or two days? (*Please tick one box only*)

Yes, badly	☐1
Yes, mildly	☐ 2
No	☐ 3

19. How often, if at all, do you use suntan lotion which has a factor of 15 or more:
(*Please tick one box for each option*)

	In the UK	**Abroad**
Always	☐1	☐1
Sometimes	☐ 2	☐ 2
Never	☐ 3	☐ 3
Do not go abroad	☐ 4	

WELLBEING

20. What sort of things do you worry about most often?
(These are the things that get you down, stress you, or make you lose sleep)

_____

_____

21. **a)** Here are some things that other people your age have said they worry about:
Tick any of those that you worry about.

MYSELF

1. The future	☐ 1
2. My appearance (height, weight, looks)	☐ 2
3. Being shy	☐ 3
4. Feeling lonely	☐ 4
5. Lacking confidence	☐ 5
6. Having no one to talk to	☐ 6
7. Having nothing to do	☐ 7
8. Being under too much pressure	☐ 8
9. Being bullied	☐ 9
10. The environment	☐ 10
11. Crime	☐ 11
12. Having nothing to look forward to	☐ 12
13. School work/exams	☐ 13
14. Not having any money	☐ 14
15. Not being able to get a job	☐ 15

Q21/

MY FAMILY/FRIENDS

16. Family issues (rows, divorce, bereavement, violence, abuse) ☐ 16
17. Not being able to talk to my parents ☐ 17
18. Not getting on with my brother/sister(s) ☐ 18
19. Not getting on with my friends ☐ 19
20. Not getting on with boy/girlfriend ☐ 20

b) Please write **the three things or write the three numbers** from the list above that you would worry about most often

_____

22. Thinking about the last time you were worried or felt down in some way, what things did you do to help yourself feel better or less worried?

_____

_____

23. Here is a list of things that other people your age have said they do to make themselves feel better. Which of these things would you do to help yourself feel better or less worried?

	Yes	**No**
a) Think about something else; try to forget it or go and do something like watch TV or play games to get it out of your mind --------→	☐ 1	☐2
i) **If Yes** did this help? Yes ☐ 1 No ☐2		
b) Talk to no-one/try to sort myself out ----------→	☐ 1	☐ 2
i) **If Yes** did this help? Yes ☐ 1 No ☐2		
c) Try to see the good side of things and/or concentrate on something good that could come out of it ----------→	☐ 1	☐ 2
i) **If Yes** did this help? Yes ☐ 1 No ☐2		
d) Try to do some exercise/physical activity, like going for a walk/play sports ----------→	☐ 1	☐ 2
i) **If Yes** did this help? Yes ☐ 1 No ☐2		
e) Write about things/paint/draw/--------- ----------→	☐ 1	☐ 2
i) **If Yes** did this help? Yes ☐ 1 No ☐2		
f) Eat more ----------→	☐ 1	☐ 2
i) **If Yes** did this help? Yes ☐ 1 No ☐2		
g) Drink more----------→	☐ 1	☐ 2
i) **If Yes** did this help? Yes ☐ 1 No ☐2		

h) Smoke more ----------→ ☐ 1 ☐ 2

i) **If Yes** did this help? Yes ☐ 1 No ☐2

Q23/

i) Use drugs ----------→ ☐ 1 ☐ 2

i) **If Yes** did this help? Yes ☐ 1 No ☐2

j) Spend more time being sociable, going out with friends/family→ ☐ 1 ☐2

i) **If Yes** did this help? Yes ☐ 1 No ☐2

k) Go shopping ----------→ ☐ 1 ☐ 2

i) **If Yes** did this help? Yes ☐ 1 No ☐2

l) Listen to/play music ----------→ ☐ 1 ☐ 2

i) **If Yes** did this help? Yes ☐ 1 No ☐2

m) Get more information/discuss the problem further----------→ ☐ 1 ☐ 2

i) **If Yes** did this help? Yes ☐ 1 No ☐2

ii) Where did you go for information/to discuss the problem further (ie. Youth worker, guidance staff, magazines)

_____

_____

The following three questions are asking you about how you feel. There are no right or wrong answers because we are all different. We just want you to think carefully about each question and answer them all.

24. Here are lots of words which describe different kinds of feelings. Please ring in the box below
FIVE words which describes how you are feeling today

25. a)

THREE things which make me **happy** are:

b)

THREE things which make me feel **unhappy** are:

c)

THREE things which make me **feel good** about myself are:

d)

THREE things which make me **feel bad** about myself are:

26. a)

I can talk about my feelings to:
(You can give more than one answer here)

b)

If I felt bad I would:

c)

When I feel bad I would like it if:
(Think about who you would want to help you, and how)

FOOD

27. To what extent do you agree with the following statements? *(Please tick one box for each option)*

	Agree	Neither agree nor disagree	Disagree
A balanced diet is essential for good health	☐ 1	☐ 2	☐ 3
Eating too many fatty foods may make you put on weight	☐ 1	☐ 2	☐ 3
People my age don't need to worry that a poor diet can cause heart disease	☐ 1	☐ 2	☐ 3
Healthy eating messages are confusing	☐ 1	☐ 2	☐ 3
Healthy eating costs more	☐ 1	☐ 2	☐ 3
People are not given enough information on healthy eating	☐ 1	☐ 2	☐ 3

28. How often do you usually have the following meals? *(Please tick one box for each option)*

	Every day	2-6 days a week	1 day a week	Less often than 1 day a week
Breakfast	☐1	☐2	☐3	☐4
Lunch (mid day meal)	☐1	☐2	☐3	☐4
Tea (or evening meal)	☐1	☐2	☐3	☐4

29. Apart from your main meals (eg. breakfast, lunch, tea/dinner), on average how many times do you have a snack each day consisting of: *(Please tick one box only)*

Chocolate bars/Sweets/cakes&biscuits

☐1 None
☐2 One
☐3 Two
☐4 Three
☐5 More than 3

Crisps/savoury snacks

☐1 None
☐2 One
☐3 Two
☐4 Three
☐5 More than 3

30. a) How often do you drink each of the following? *(Please tick one box for each line)*

	Never or Rarely	Less than once a week but more than once a month	1 day a week	2 days a week	3-6 days a week	Every Day
Coffee	☐1	☐2	☐3	☐4 ☐5	☐6	
Tea	☐1	☐2	☐3	☐4	☐5	☐6
Coke/other fizzy drinks which contain sugar	☐1	☐2	☐3	☐4	☐5	☐6
Diet/Sugar-free coke or other fizzy drinks	☐1	☐2	☐3	☐4	☐5	☐6
Milk	☐1	☐2	☐3	☐4	☐5	☐6

b) How often, if ever, do you eat these foods? *(Please tick one box for each food type)*

	Never or Rarely	Less than once a week but more than once a month	1 day a week	2 days a week	3-6 days a week	Every Day
Chips/fried potatoes	☐1	☐2	☐3	☐4	☐5	☐6
Potatoes (baked, boiled, mashed)	☐1	☐2	☐3	☐4	☐5	☐6
Pasta or rice	☐1	☐2	☐3	☐4	☐5	☐6
White bread/roll/toast	☐1	☐2	☐3	☐4	☐5	☐6
Brown bread/roll/toast	☐1	☐2	☐3	☐4	☐5	☐6
Wholemeal bread/roll/toast	☐1	☐2	☐3	☐4	☐5	☐6
Breakfast cereal	☐1	☐2	☐3	☐4	☐5	☐6
Fish	☐1	☐2	☐3	☐4	☐5	☐6
Fish products eg. fish fingers	☐1	☐2	☐3	☐4	☐5	☐6
Chicken/turkey	☐1	☐2	☐3	☐4	☐5	☐6
Burgers/ sausages/ meat pies	☐1	☐2	☐3	☐4	☐5	☐6
Red meat (eg. mince, beef, pork)	☐1	☐2	☐3	☐4	☐5	☐6
Cheese	☐1	☐2	☐3	☐4	☐5	☐6
Eggs	☐1	☐2	☐3	☐4	☐5	☐6
Yogurt	☐1	☐2	☐3	☐4	☐5	☐6

31. a) How many pieces/helpings of fresh/frozen/tinned fruit do you eat each day?

. . . . . .

c) How many helpings of fresh/frozen/tinned vegetables or salad do you eat each day?
(excluding potatoes)

. . . . . .

32. Which type of milk do you use most often? *(Please tick one box only)*

☐ 1 Whole milk (Full Cream – blue top)
☐ 2 Semi-Skimmed (including Fresh & Low – green top)
☐ 3 Skimmed (red top)
☐ 4 Soya/ vegetable-based milk
☐ 5 None
☐ 6 Other

If **OTHER**, please give details……

33. If you wanted to change your diet, which of the following would be helpful to you personally?
(Please tick one box for each option)

	Very Helpful	**Helpful**	**Not Very Helpful**
Information on what is needed for a healthy diet	☐ 1	☐ 2	☐ 3
Basic cooking skills	☐ 1	☐ 2	☐ 3
Clearly labelled healthier choices in canteens, shops, restaurants	☐ 1	☐ 2	☐ 3
Having 'healthier cooking' recipes	☐ 1	☐ 2	☐ 3
Better availability of healthier food choices at school	☐ 1	☐ 2	☐ 3
Better availability of healthier food choices in shops/supermarkets	☐ 1	☐ 2	☐ 3
Being able to taste new products in shops/supermarkets	☐ 1	☐ 2	☐ 3
Other	☐ 1	☐ 2	☐ 3

If **'Other'**, please give details .....

PHYSICAL ACTIVITY

PHYSICAL ACTIVITY is any body movement that requires you to use energy.

Vigorous activity is activity which increases your heart rate considerably, causes you to be 'puffed out' or exhausted eg. running, football, hockey (hard/very hard).

Moderate activity is activity that increases your heart rate slightly, but doesn't leave you exhausted. eg. brisk walking, cycling, dancing

DURING SCHOOL HOURS

34. How many **HOURS** a week are you moderately active in class time? *(Please tick one box only)*

None	☐ 1
About half an hour	☐ 2
About 1 hour	☐ 3
About 2 to 3 hours	☐ 4
About 4 to 6 hours	☐ 5
About 7 or more hours	☐ 6

DURING SCHOOL HOURS

35. In breaktimes how many **HOURS** a week are you physically active, eg. playing football, netball, games, walking, cycling etc? *(Please tick one box only)*

None	☐ 1
About half an hour	☐ 2
About 1 hour	☐ 3
About 2 to 3 hours	☐ 4
About 4 to 6 hours	☐ 5
About 7 or more hours	☐ 6

OUTSIDE SCHOOL HOURS

36. How **OFTEN** are you vigorously active in your free time so much so that you get out of breath or sweat? (*Please tick one box only)*

Every day	☐ 1
4 to 6 times a week	☐ 2
2 to 3 times a week	☐ 3
Once a week	☐ 4
Less than once a week but more than once a month	☐ 5
Rarely	☐ 6
Never	☐ 7

37. **OUTSIDE SCHOOL HOURS:**
How many **HOURS** a week are you physically active? (*Please tick one box only*)

None	☐ 1
About half an hour	☐ 2
About 1 hour	☐ 3
About 2 to 3 hours	☐ 4
About 4 to 6 hours	☐ 5
About 7 hours or more	☐ 6

LEISURE ACTIVITY

38. How many hours **a day** do you usually watch TV? (*Please tick one box only*)

Not at all	☐ 1
Less than half an hour a day	☐ 2
Between 1 and 3 hours	☐ 3
Between 3 and 4 hours	☐ 4
4 hours	☐ 5
More than 4 hours	☐ 6

39. How many hours **a day** do you usually play computer games? (*Please tick one box only*)

Not at all	☐ 1
Less than half an hour a day	☐ 2
Between 1 and 3 hours	☐ 3
Between 3 and 4 hours	☐4
4 hours	☐ 5
More than 4 hours	☐ 6

WALKING

40. How many days a week (including Saturdays and Sundays) do you usually do any brisk walking that lasts for **at least 10 minutes? Please include all types of walking. For example, walking to school, to a friend's house, to clubs, to the shops, dog walking, paper rounds or just going for a walk**. (*Please tick one box only*)

☐ 1 None----------→ **Go to Question 42**

1 day a week	**2 days a week**	**3 days a week**	**4 days a week**	**5 days a week**	**6 days a week**	**7 days a week**
☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8

Go to question 41

41. On the days that you do some brisk walking, about how long on average do you spend, in total, on each day? (*Please tick one box only*)

- ☐ 1 Less than 15 minutes
- ☐ 2 At least 15 minutes but less than 30 minutes
- ☐ 3 At least 30 minutes but less than 1 hour
- ☐ 4 1 hour or more

ACTIVITIES NOT IN SCHOOL LESSONS

42. Please read the following list of activities and tick any that you do outside of school lessons.
Include activities that you do at break times, dinnertime, before school, after school or at weekends (*Please tick all that apply*)

- ☐ 1 Swimming
- ☐ 2 Football, tennis, basketball, hockey, netball or other ball games
- ☐ 3 Athletics, gymnastics, boxing, karate, judo
- ☐ 4 Aerobics, keep fit, jogging, running
- ☐ 5 Running about outdoors/kicking a ball about
- ☐ 6 Roller skating, rollerblading, skateboarding, ice-skating
- ☐ 7 BMXing, mountain biking
- ☐ 8 Dancing (disco, rave, ballet, at home or at clubs)
- ☐ 9 Hillwalking
- ☐ 10 Any other activities that make you at least a bit out of breath or warmer than usual

If any of these go to Q43

- ☐ 11 None ----------→**Go to Question 45**

43. Thinking about all the things you've ticked at **question 42**, on how many days a week do you do any of these activities. (*Please tick one box only*)

- ☐ 1 Less often than once a week ----------→ **Go on to Question 45**

1 day a week	**2 days a week**	**3 days a week**	**4 days a week**	**5 days a week**	**6 days a week**	**7days a week**
☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8

Go to question 44

44. On the days that you do some of these activities, about how long on average do you spend, in total, on **each day?** (*Please tick one box only*)

- ☐ 1 Less than 15 minutes
- ☐ 2 At least 15 minutes but less than 30 minutes
- ☐ 3 At least 30 minutes but less than 1 hour
- ☐ 4 1 hour or more

45. Would you consider taking more exercise for any of the following reasons? *(Please tick Yes or No)*

	Yes	No
To win	☐ 1	☐ 2
To have fun	☐ 1	☐ 2
To improve your health	☐ 1	☐ 2
To improve your appearance	☐ 1	☐ 2
To help you lose weight	☐ 1	☐ 2
To make you feel fitter	☐ 1	☐ 2
To decrease your risk of heart disease	☐ 1	☐ 2
To make more friends	☐ 1	☐ 2
To help you relax/feel better	☐ 1	☐ 2
Other	☐ 1	☐ 2

If **'Other'**, please give details.....

46. Do the following reasons prevent you from taking more exercise? *(Please tick Yes or No)*

	Yes	No
<u>In School Time</u>		
Don't like participating with opposite sex	☐ 1	☐ 2
Don't like competitive activities	☐ 1	☐ 2
Don't like PE uniform	☐ 1	☐ 2
Don't have time to shower after activity before next class	☐ 1	☐ 2
Don't like the choice of activities	☐ 1	☐ 2
None of my friends want to	☐ 1	☐ 2
Not enough teams or activities to join	☐ 1	☐ 2
<u>In Free Time</u>		
Exams, homework takes up too much time	☐ 1	☐ 2
Lack of spare time at evenings/weekends	☐ 1	☐ 2
Lack of money	☐ 1	☐ 2
Lack of company, eg. friends	☐ 1	☐ 2
Lack of facilities nearby, eg swimming pool	☐ 1	☐ 2

Lack of transport	☐ 1	☐ 2
You don't know what's on	☐ 1	☐ 2
You already take enough exercise	☐ 1	☐ 2
You don't like exercise	☐ 1	☐ 2

Other please give details _____

SMOKING

SECTION A

47. To what extent do you agree with the following statements? *(Please tick one box for each statement)*

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
People who smoke are damaging their health	☐1	☐2	☐3	☐4	☐5
Cigarette smoke can damage the health of non-smokers	☐1	☐2	☐3	☐4	☐5
Cigarette smoke annoys non-smokers	☐1	☐2	☐3	☐4	☐5
Smoking is an expensive habit	☐1	☐2	☐3	☐4	☐5
The Tobacco Industry advertises tobacco to encourage young people to smoke	☐1	☐2	☐3	☐4	☐5
Once people start smoking they are unlikely to stop	☐1	☐2	☐3	☐4	☐5
Shop assistants should ask for ID before selling tobacco to young people	☐1	☐2	☐3	☐4	☐5

48. How often are you in places where there is smoke from <u>other people</u> smoking tobacco? *(Please tick one box only)*

☐ 1 I usually spend most of the day in places where other people are smoking
☐ 2 I often spend some of my day in places where other people are smoking
☐ 3 I am seldom in places where other people are smoking

49. Do any of the following people you know smoke? *(Please tick one box for each option)*

	Yes	No	Doesn't Apply
Mother or female guardian	☐ 1	☐ 2	☐ 3
Father or male guardian	☐ 1	☐ 2	☐ 3
Grandmother or grandfather	☐ 1	☐ 2	☐ 3
Brother or sister	☐ 1	☐ 2	☐ 3
Boyfriend or girlfriend	☐ 1	☐ 2	☐ 3
Close friend	☐ 1	☐ 2	☐ 3
Other	☐ 1		

If **'Other'**, please give details .....

50. Which statement **best** describes you? *(Please tick one box only)*

I smoke every day	☐ 1	}	**Go to**
I smoke some days	☐ 2	}	**Question 51**
I smoke at weekends/socially	☐ 3	}	
I have given up smoking	☐ 4	}	**Go to**
I have only tried smoking once or twice	☐ 5	}	**Question 60**
I have never smoked tobacco	☐ 6	}	

51. Thinking of your own smoking habits which of the following statements would you agree with:
(Please tick either yes or no for each statement)

	Yes	No
I wouldn't consider myself a smoker – I only smoke when I **want to**	☐ 1	☐ 2
I only smoke when I **need to**	☐ 1	☐ 2
I enjoy smoking – I don't want to stop	☐ 1	☐ 2
I'm a smoker- I want to stop but I can't	☐ 1	☐ 2
I only smoke so I can use cannabis	☐ 1	☐ 2
I find it difficult not to smoke when I am drinking alcohol	☐ 1	☐ 2

IF YOU ARE AT PRESENT A NON-SMOKER PLEASE IGNORE SECTION B AND MOVE ON TO THE ALCOHOL SECTION – QUESTION 60

SECTION B

PLEASE ANSWER THE QUESTIONS IN THIS SECTION ONLY IF YOU SMOKE AT PRESENT

52. What age were you when you started smoking?

..... years

53. In a day, how many cigarettes do you smoke? *(Please tick one box only)*

☐	1	Less than 1 cigarette a day
☐	2	1-5 cigarettes a day
☐	3	6-10 cigarettes a day
☐	4	11-15 cigarettes a day
☐	5	16-20 cigarettes a day
☐	6	More than 20 cigarettes a day

54. People smoke for many reasons. Which of the following reasons for smoking apply to you?
(Please tick Yes or No)

	Yes	No
You enjoy the taste	☐ 1	☐ 2
It calms your nerves and helps you relax	☐ 1	☐ 2
You feel smoking relieves boredom	☐ 1	☐ 2
You feel smoking gives you confidence	☐ 1	☐ 2
You smoke because your friends smoke	☐ 1	☐ 2
You feel addicted to smoking	☐ 1	☐ 2
You wanted to try smoking out of curiosity	☐ 1	☐ 2

If there is any other reason why you smoke, please give details.....

55. Do you usually smoke in the following places? *(Please tick Yes or No)*

	Yes	No
At home	☐ 1	☐ 2
At friend's home	☐ 1	☐ 2
In the street	☐ 1	☐ 2
At parties	☐ 1	☐ 2
At school	☐ 1	☐ 2
On school bus	☐ 1	☐ 2
In cafes/pubs/nightclubs	☐ 1	☐ 2
Other	☐ 1	

If **'Other'**, please specify .....

56. Where do you get your cigarettes from? *(Please tick all that apply)*

Friends	☐ 1
Mother/father/guardian	☐ 2
Other relatives	☐ 3
Shop/ice cream van	☐ 4
Vending machines	☐ 5
Other	☐ 6

If **'Other'**, please give details.....

57. Would you like to give up smoking? *(Please tick one box only)*

Yes	☐ 1
No	☐ 2

a) **If Yes**, do you want to give up for any of the following reasons? *(Please tick one box for each option)*

	Yes	No
To improve fitness	☐ 1	☐ 2
To prevent disease and ill health	☐ 1	☐ 2
To save money	☐ 1	☐ 2
To be more attractive	☐ 1	☐ 2
To respect the wishes of non-smokers	☐ 1	☐ 2
Other	☐ 1	

If **'Other'**, please specify .....

b) **If No** is it for any of the following reasons?

	Yes	**No**
I smoke to use cannabis	☐ 1	☐ 2
I can stop smoking at any time	☐ 1	☐ 2
I am not ready to stop smoking	☐ 1	☐ 2

58. In the last year, have you tried to cut down or give up smoking? (*Please tick Yes or No*)

Cut down	Yes ☐1	No ☐2
Give up	Yes ☐1	No ☐2

a) If **'you gave up smoking'**, did you get help? *(Please tick one box only)*

Yes ☐ 1
No ☐ 2

i) If **'Yes'**, what help, if any, did you receive? *(Please tick all that apply)*

Telephone helpline	☐ 1
Advice from website	☐ 2
Advice from teacher	☐ 3
Advice from school nurse	☐ 4
Advice from youth worker	☐ 5
Contact Smoking Advice Service	☐ 6
Use Nicotine Replacement Therapy	☐ 7
Advice from parents	☐ 8
Advice from friends	☐ 9
No help received	☐10

ii) If **'No'**, can you say why not……

b) If you used Nicotine Replacement Therapy(NRT)

Did it help you to stop smoking Yes ☐ 1 No ☐ 2

Where did you get the Nicotine Replacement Therapy from

Parents ☐ 1 Pharmacy ☐ 2

59. If you wanted to stop smoking, what do you think would help you to stop? (*Tick all that apply*)

☐ 1 Making cigarettes more expensive
☐ 2 Attending a stop smoking group
☐ 3 Encouragement and support from friends
☐ 4 A booklet offering advice and practical tips
☐ 5 Telephone helpline/advice line
☐ 6 Advice from your doctor or health care worker
☐ 7 Other

If **'Other'**, please specify …….

ALCOHOL

SECTION A

60. To what extent do you agree with the following statements? *(Please tick one box for each statement)*

	Agree	Not sure	Disagree
Drinking too much alcohol can cause health problems	☐ 1	☐ 2	☐ 3
Once you start drinking alcohol regularly it may be difficult to stop	☐ 1	☐ 2	☐ 3
Alcohol is expensive	☐ 1	☐ 2	☐ 3
Drinking alcohol makes people lose control of themselves	☐ 1	☐ 2	☐ 3
Drunk people are unpleasant	☐ 1	☐ 2	☐ 3
Drinking alcohol helps people to relax	☐ 1	☐ 2	☐ 3
Drinking alcohol is sociable	☐ 1	☐ 2	☐ 3
Drinking alcohol is enjoyable	☐ 1	☐ 2	☐ 3
Drinking alcohol helps people forget their worries	☐ 1	☐ 2	☐ 3
People under 18 should be allowed to buy alcohol	☐ 1	☐ 2	☐ 3
Drinking alcohol makes people violent	☐ 1	☐ 2	☐ 3

61. Have you ever taken an alcoholic drink? *(Please tick one box only)*

☐ 1 Yes ----------→ **If YES, please answer the questions in SECTION B**

☐ 2 No ----------→ **If NO, please go to Q67**

SECTION B

ANSWER THE FOLLOWING QUESTIONS ONLY IF YOU HAVE TASTED AN ALCOHOLIC DRINK

(ALL REPLIES ARE ANONYMOUS)

62. Which of the following statements best applies to you? *(Please tick one box only)*

☐ 1 I have given up alcohol }
☐ 2 I drink alcohol once or twice a year } **Go To Q67**

☐ 3 I drink alcohol less than once a month
☐ 4 I drink alcohol more than once a month, but not weekly
☐ 5 I drink alcohol 1 or 2 days a week **Go To Q63**
☐ 6 I drink alcohol between 3 and 5 days a week
☐ 7 I drink alcohol 6 or 7 days a week

63. Do you usually drink in the following places? *(Please tick Yes or No)*

	Yes	**No**
At home with family	☐ 1	☐ 2
At home without family	☐ 1	☐ 2
In the street	☐ 1	☐ 2
At parties	☐ 1	☐ 2
At school	☐ 1	☐ 2
In pubs/night-clubs	☐ 1	☐ 2
In restaurants/cafes	☐ 1	☐ 2
Other	☐ 1	

If '**Other**', please specify.....

64. Have you had an alcoholic drink in the past 7 days? *(Please tick one box only)*

☐ 1 Yes

☐ 2 No ----------→ Go to Question 65

If **'Yes'**, please complete the following table to indicate the number of alcoholic drinks you have had on each of the seven days? (Exclude any low-alcohol drinks).

Indicate <u>number</u> of alcoholic drinks or amounts of alcohol drunk eg. ½ btl, 1/4btl, 1 or ½ pint

	Mon	**Tue**	**Wed**	**Thurs**	**Fri**	**Sat**	**Sun**
Pints of shandy							
Pints of beer/lager/stout/ cider (normal strength)							
Pints/cans of extra strong beer/cider (eg. special brew, strong white cider)							
Spirits (eg. rum, southern comfort, vodka)							
Fortified wine (eg. Buckfast)							
Alcopops (eg. hooch)							
Glasses of wine							
Other							

65. There are many reasons why people drink. Do you drink alcohol for any of the following reasons? Because:- *(Please tick yes or no for each reason)*

	Yes	**No**
You like the taste of alcohol	☐ 1	☐ 2
You feel that drinking alcohol is an adult thing to do	☐ 1	☐ 2
It helps you to relax	☐ 1	☐ 2
You like the way it makes you feel	☐ 1	☐ 2
It helps you to talk to people more easily	☐ 1	☐ 2
You don't want to feel like the 'odd one out' among your friends	☐ 1	☐ 2
It helps you forget your problems	☐ 1	☐ 2
You want to get drunk	☐ 1	☐ 2
Other	☐ 1	

If '**Other**', please specify.....

66. Would you like to cut down on the amount of alcohol you drink? *(Please tick one box only)*

Yes ☐ 1
No ☐ 2

If **'Yes'**, would the following help you to do so? *(Please tick one box for each option)*

	Yes	**No**
Advice and support from family and friends	☐ 1	☐ 2
Advice and support from teachers	☐ 1	☐ 2
Advice from an Alcohol Advisory Group	☐ 1	☐ 2
Leading a less stressful life	☐ 1	☐ 2
More recreation and sports facilities available at reasonable prices	☐ 1	☐ 2
Meeting a new group of friends	☐ 1	☐ 2
Information from Health Promotions	☐ 1	☐ 2
Other	☐ 1	

If '**Other**', please specify.....

ACCIDENTS/SAFETY

67. In the last 12 months, have you had any kind of accident that needed medical attention?
(Please tick one box only)

Yes ☐ 1
No ☐ 2

a) If **'Yes'**, how many accidents have you had: . . . . . .

b) Where were your injuries treated: *(Please tick all that apply)*

		how many times
In hospital (overnight stay)	☐ 1	_____
At casualty department (not admitted to hospital)	☐ 2	_____
At doctors surgery	☐ 3	_____
At dentists surgery	☐ 4	_____
Other	☐ 5	_____

If **other**, please specify……

ROAD SAFETY

68. Do you cycle regularly? *(Please tick one box only)*

Yes	☐1
No	☐2

If **'Yes'**, *(Please tick Yes or No for each option)*

	Yes	No
Do you regularly check your bicycle for faults	☐ 1	☐ 2
Do you wear fluorescent clothing by day and/or reflective clothing by night	☐ 1	☐ 2
Do you know your Highway Code	☐ 1	☐ 2
Have you passed a cycling proficiency test	☐ 1	☐ 2
Do you wear safety gear (eg. helmet, kneepads etc)	☐ 1	☐ 2

69. Do you do any of the following? *(Please tick Yes or No for each option)*

	Yes	No
Rollerblading	☐1	☐2
Skateboarding	☐1	☐2

If **'Yes',** do you wear safety gear (eg. helmet, kneepads etc)?

	Yes	No
Rollerblading	☐1	☐2
Skateboarding	☐1	☐2

70. What is your main method of transport to school (*Please tick one box only*)

☐ 1	Walking
☐ 2	School bus
☐ 3	Car
☐ 4	Cycle
☐ 5	Taxi
☐ 6	Train
☐ 7	Public Transport Bus
☐ 8	Other

GRAMPIAN HEART CAMPAIGN

71. Do you know of any relatives or friends who have/have had heart disease? *(Please tick one box only)*

☐1 Yes
☐2 No

72. Which of the following do you think is linked to heart disease? *(Please tick all that apply)*

☐1 High Blood Pressure
☐2 Lack of sleep
☐3 Taking drugs
☐4 Eating an unhealthy diet
☐5 Drinking too much alcohol
☐6 Running too fast
☐7 Getting soaked in the rain
☐8 Stress
☐9 Smoking tobacco
☐10 Eating too fast
☐11 Family history of heart disease
☐12 Other (Please specify) ……

73. Have you ever heard of the Grampian Heart Campaign? *(Please tick one box only)*

☐1 Yes
☐2 No

If **YES** where did you hear about the Grampian Heart Campaign? *(Please tick all that apply)*

☐ 1 At school
☐ 2 On television
☐ 3 On radio
☐ 4 On T-shirts
☐ 5 On posters/leaflets
☐ 6 Car stickers
☐ 7 Competitions
☐ 8 Newspaper
☐ 9 Friend/relative
☐ 10 Bus advertisement
☐ 11 **Other**, please specify……

HIV

74. To what extent do you worry about becoming HIV positive (the cause of AIDS)?
(Please tick one box only)

A lot	☐ 1
Quite a lot	☐ 2
A little	☐ 3
Not at all	☐ 4

75. Please say whether you agree or disagree with the following statements:
(Please tick one box for each option)

	Agree	**Disagree**	**Not Sure**
A person can get HIV by shaking hands with someone who is HIV positive	☐ 1	☐ 2	☐ 3
A person can get HIV by sharing needles/ syringes with someone who is HIV positive	☐ 1	☐ 2	☐ 3
A person can get HIV by having sexual intercourse with someone who is HIV positive	☐ 1	☐ 2	☐ 3
A pregnant woman who has HIV can pass it on to her baby	☐ 1	☐ 2	☐ 3
A person can get HIV by donating blood	☐ 1	☐ 2	☐ 3
A person can become infected by HIV by sharing a cup or glass with someone who is HIV positive	☐ 1	☐ 2	☐ 3
A person can get HIV by swallowing street drugs	☐ 1	☐ 2	☐ 3
A person can protect themselves from HIV by using condoms every time they have sex	☐ 1	☐ 2	☐ 3

RELATIONSHIPS

76. Have you ever had, or do you currently have a boyfriend/girlfriend? *(Please tick one box only)*

☐ 1 Yes ----------→ **Go To Q77**
☐ 2 No ----------→ **Go To Q78**

PLEASE ANSWER QUESTION 77 ONLY IF YOU HAVE PREVIOUSLY HAD, OR CURRENTLY HAVE A BOYFRIEND OR GIRLFRIEND

77. When you have been with a boyfriend/girlfriend, did you participate in any of the following?
(Please tick one box for each option)

(**REMEMBER ALL REPLIES ARE ANONYMOUS)**

	Never	**Occasionally**	**Frequently**
Hugging	☐ 1	☐ 2	☐ 3
Kissing on the mouth	☐ 1	☐ 2	☐ 3
Light petting (fondling, caressing above waist)	☐ 1	☐ 2	☐ 3
Heavy petting (fondling, caressing below waist)	☐ 1	☐ 2	☐ 3
Oral sex	☐ 1	☐ 2	☐ 3
Sexual intercourse	☐ 1	☐ 2	☐ 3

ALL ANSWER Q78-81

78. Do you know: *(Please tick one box for each option)*

	Yes	**No**
Where to get condoms free of charge	☐ 1	☐ 2
If you can get contraceptive advice if you are under 16	☐ 1	☐ 2

Comments.....

79. Would you feel comfortable discussing questions about sex with?
(Please tick one box for each option)

	YES	NO
Friends	☐ 1	☐ 2
Parents/guardian	☐ 1	☐ 2
Brothers or sisters	☐ 1	☐ 2
Other relatives, ie. aunts, uncles	☐ 1	☐ 2
Teachers	☐ 1	☐ 2
School nurse	☐ 1	☐ 2
Doctor	☐ 1	☐ 2
Outside speakers in school	☐ 1	☐ 2
Youth worker	☐ 1	☐ 2
Phone line service	☐ 1	☐ 2
Other	☐ 1	

If **'Other'**, please give details.....

80. Where do you think contraception e.g. condoms and advice should be available from?
(Please tick all that apply)

School	☐ 1
GP	☐ 2
GUM (sexually transmitted infection clinic)	☐ 3
Family planning	☐ 4
Libraries	☐ 5
Community education	☐ 6
Other	☐ 7

If **'Other'**, please specify .....

81. Have you ever heard of these sexually transmitted infections
(Please tick one box for each option)

	Yes	No	Not Sure
Chlamydia	☐ 1	☐ 2	☐ 3
Genital warts	☐ 1	☐ 2	☐ 3
Genital herpes	☐ 1	☐ 2	☐ 3
Gonorrhea	☐ 1	☐ 2	☐ 3
Hepatitis B	☐ 1	☐ 2	☐ 3
HIV/AIDS	☐ 1	☐ 2	☐ 3

PLEASE ANSWER QUESTIONS 82-84 ONLY IF YOU HAVE HAD SEXUAL INTERCOURSE

82. The first time that you had sexual intercourse, did you or your partner use protection? *(Please tick one box only)*

☐ 1 Yes
☐ 2 No

If **'Yes'**, was it: *(Please tick all that apply)*

☐ 1 Pill
☐ 2 Condom
☐ 3 Other

If **'Other'**, please specify .....

83. a) When having sexual intercourse, do you and your partner use protection? *(Please tick one box only)*

☐ 1 Always
☐ 2 Nearly Always
☐ 3 Sometimes
☐ 4 Never

If not Always why not .....

b) If you use a contraceptive, which type do you use? *(Please tick all that apply)*

☐ 1 Pill
☐ 1 Emergency contraception (eg. morning after pill)
☐ 2 Condom
☐ 3 Other

If **'Other'**, please specify .....

84. Have you ever experienced any problems when trying to obtain contraceptives? *(Please tick one box only)*

☐ 1 Yes
☐ 2 No

If **'Yes'**, please give details .....

DRUGS

The following questions are about drugs. By 'drugs' we mean those substances that have NOT been given to you by a doctor or pharmacist for medical reasons. (These substances do not include Alcohol & Tobacco)

(PLEASE REMEMBER ALL REPLIES ARE ANONYMOUS)

85. To what extent do you agree with the following statements? *(Please tick one box for each statement)*

	Agree	Uncertain	Disagree
Taking drugs not prescribed by a doctor or pharmacist can cause health problems	☐ 1	☐ 2	☐ 3
Once you start taking drugs regularly it is difficult to stop	☐ 1	☐ 2	☐ 3
Taking drugs makes people lose control of themselves	☐ 1	☐ 2	☐ 3
People who take drugs are unpleasant	☐ 1	☐ 2	☐ 3
Taking drugs is sociable	☐ 1	☐ 2	☐ 3
Some drugs that are illegal should be made legal	☐ 1	☐ 2	☐ 3
There is a safe limit for taking unprescribed drugs	☐ 1	☐ 2	☐ 3
Drugs are safer than alcohol	☐ 1	☐ 2	☐ 3
Taking drugs is good for my image	☐ 1	☐ 2	☐ 3

86. a) Have you ever been offered drugs? *(Please tick one box only)*

☐ 1 Yes

☐ 2 No

b) Have you ever taken or tried drugs? *(Please tick one box only)*

☐ 1 Yes

☐ 2 No ⟷

IF YOU HAVE NEVER TAKEN ANY 'DRUGS' OR HAVE TAKEN THEM ONLY WHEN PRESCRIBED BY A DOCTOR OR PHARMACIST YOU DO NOT NEED TO ANSWER ANY FURTHER QUESTIONS. THANK YOU FOR YOUR HELP

ANSWER THE FOLLOWING QUESTIONS ONLY IF YOU HAVE TAKEN DRUGS

87. Here is a list of drugs. Being completely honest, please indicate if you have taken any of them before or not. Remember these do not include any occasions when you have been given these drugs by a doctor or pharmacist. *(Please tick one box for each option)*

	Never Taken	Taken Only Once or Twice ever	Taken less than once a week but more than once a month	1-2 days a week a	3-6 days week	Daily
Cannabis (ie. dope, blow)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Amphetamines (ie. speed, whizz)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Magic mushrooms	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
LSD, acid	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Ecstasy (E, lovedoves)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Astrabite (Bite)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Heroin (smack),	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Unprescribed DF118's, Methadone etc	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐
Cocaine (Coke)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Benzo's-Temazepam (jellies)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Diazepam (valium) etc	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Other	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

If **'Other'**, please specify.....

88. Have you taken drugs for any of the following reasons: *(Please tick one box for each option)*

	Yes	No
You like drugs	☐ 1	☐ 2
You feel that taking drugs is a mature thing to do	☐ 1	☐ 2
Drugs help you relax	☐ 1	☐ 2
You like the way drugs make you feel	☐ 1	☐ 2
Drugs help you talk to other people more easily	☐ 1	☐ 2
You don't want to feel the odd one out	☐ 1	☐ 2
Drugs help you forget your problems	☐ 1	☐ 2
You feel that you are forced to take drugs	☐ 1	☐ 2
Drugs make you dance better	☐ 1	☐ 2
Other	☐ 1	

If **'Other'**, please give details.....

89. Has your knowledge of drugs come from any of the following (please tick all that apply)

Friends		☐ 1
Teachers		☐ 2
Parents		☐ 3
Media (TV/newspapers/magazines)		☐ 4
Visits to school by outside agencies	- Health Promotions	☐ 5
	- Police	☐ 6
	- Drugs Action ☐ 7	
Leaflets		☐ 8
Other		☐ 9

If **'Other'**, please specify.....

90. Have you ever obtained drugs from the following sources? *(Please tick one box for each option)*

(ALL REPLIES ARE ANONYMOUS)

	Yes	No
Relative	☐ 1	☐ 2
Friend	☐ 1	☐ 2
Someone on the street	☐ 1	☐ 2
Someone at school	☐ 1	☐ 2
Someone at party/club	☐ 1	☐ 2
Other	☐ 1	

If 'Other', please give details

91. When you take drugs, are you usually? *(Please tick Yes or No)*

	Yes	No
At home/friend's home	☐ 1	☐2
In the street	☐ 1	☐2
At parties	☐ 1	☐2
At school	☐ 1	☐2
In pubs/night-clubs	☐ 1	☐2
In restaurants/cafes	☐ 1	☐2
Other	☐ 1	

If **'Other'**, please specify .....

THANK YOU FOR YOUR HELP

All information in this questionnaire will **only** be seen by researchers and will be kept in the **strictest confidence**

If you have any extra comments you would like to make, please write in the space below.

Appendix 2.3 The amended lifestyle survey questionnaire for 18 -25 year olds (2007)

GENERAL

ONLY COMPLETE THIS SURVEY IF YOU ARE BETWEEN 18 AND 25 YEARS OLD

1. Are you *(please tick all that apply)*

- At University ☐
- At College ☐
- Employed full time ☐
- Employed part-time ☐
- Unemployed ☐
- Long-term sick ☐

2. Are you: *(Please tick one box only)*

Male ☐ Female ☐

3. How old are you?

18	19	20	21	22	23	24	25
☐	☐	☐	☐	☐	☐	☐	☐

4. If you are a student please give your

a) University/college course

Arts ☐ Law ☐ Engineering ☐

Health Related ☐ Social Sciences ☐ Science ☐

Arts & Humanities ☐ Divinity ☐

b) Year of study

Access (eg HNC/HND/Foundation) ☐

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Postgraduate ☐

5. How would you describe your ethnic origin? *(Please tick one box only)*

- White ☐
- Asian (of Indian, Pakistani, Bangladeshi ancestry) ☐
- Black or Afro-Caribbean (of African or Caribbean ancestry) ☐
- Chinese ☐
- Other European Country ☐
- Other ethnic origin ☐

6. How long have you lived in the Grampian area?

a) All my life ☐ Less than 12 months ☐ 1-3 yrs ☐ 4-10 yrs ☐ 10+ yrs ☐

b) Where have you lived the majority of your life?

UK ☐
Europe ☐
North America ☐
Other ☐

7. What are your current living arrangements?

Living alone all of the time ☐
Living alone Mon-Fri (or away from home) ☐
Living with others ☐

8. How tall are you in bare feet
(please state either feet and inches **OR** metres and centimetres)

Feet 3 ☐ 4 ☐ 5 ☐ 6 ☐ Other ☐

Inches

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐

OR

Metres *(please cross box for metres and write in amount of centimetres)*

1 ☐ 2 ☐ 3 ☐ **Centimetres** ☐☐

9. What weight are you without clothes?
(please state either stones and pounds **OR** kilograms)

Stones

4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐ 13 ☐ 14 ☐ 15 ☐ 16 ☐ 17 ☐ 18 ☐

Other stones ☐☐

Lbs

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐ 13 ☐ 14 ☐

OR

Kilograms ☐

10. If you know your current postcode, please print the first five letters and numbers in the boxes below.

ie A B 2 3 6

☐☐☐☐ ☐

HEALTH

11. In general, would you say your health is: *(Please tick one box only)*

Very good	☐
Good	☐
Average	☐
Poor	☐
Very poor	☐

12. Do you have any long term illness or disability? *(Please tick one box only)*

Yes	☐
No	☐

If **'Yes'** is this? *(Please tick all that apply)*

Asthma	☐	Arthritis	☐
Epilepsy	☐	Irritable Bowel Syndrome/	☐
Heart condition	☐	Colitis/bowel disorder	
Diabetes	☐	Hearing problems	☐
Eye/sight problems	☐	Other	☐

13. Do you feel? *(Please tick Yes or No for each line)*

	Yes	**No**
Overweight	☐	☐
Underweight	☐	☐
Happy with your body	☐	☐
Fit and healthy	☐	☐
Worried about gaining weight	☐	☐
Unhappy if you eat too much	☐	☐
You eat a well balanced diet	☐	☐

14. Over the last year, have you tried to: *(Please tick Yes or No for each line)*

	Yes	No
Take more exercise	☐	☐
Change your diet	☐	☐
Relax more often	☐	☐
Get a good night's sleep	☐	☐

15. How often do you feel under stress*? (Please tick one box only)*

Always	☐
Frequently	☐
Occasionally	☐
Never	☐

SKIN CARE

16. How often, if at all, do you use suntan lotion which has a factor of 15 or more? *(Please tick one box for each line)*

	Always	Sometimes	Never
UK	☐	☐	☐
Abroad	☐	☐	☐

Do not go abroad ☐

DENTAL HEALTH

17. Are you registered with a dentist?

Yes	☐
No	☐
Don't know	☐

18. a) When did you last visit a dentist *(Please tick one box only)*

Within the last 6 months	☐
7-12 months ago	☐
Between 1 and 2 years ago	☐
More than 2 but less than 5 years ago	☐
5 or more years ago	☐

b) Was this for: *(Please tick one box only)*

check-up	☐
treatment (eg filling, extraction orthodontic treatment)	☐

19. Do you take any of the following steps to improve your dental health?
(Please tick Yes or No for each line)

	Yes	No
Use dental floss	☐	☐
Use toothpaste	☐	☐
Brush your teeth	☐	☐
Use a mouthwash	☐	☐
Avoid having sugary foods or drinks between meals	☐	☐
Use something else to prevent problems	☐	☐

ACCIDENTS

20. In the last 12 months, have you had any kind of accident that needed medical attention for cuts or injuries? *(Please tick one box only)*

Yes ☐
No ☐

If YES – was the accident:

Road traffic accident ☐
At university/college/work ☐
At Home ☐
When doing sport ☐
Other ☐

ONLY FEMALES ANSWER QUESTIONS 21-24

MALES GO TO QUESTION 25 - Wellbeing Section

WOMEN'S HEALTH

21 Are you pregnant? Yes ☐ No ☐

22 Have you ever had a baby? Yes ☐ No ☐

IF YES, did you breastfeed your 'last' baby? Yes ☐ No ☐

IF YOU BREASTFED, for how long did you breastfeed?

(Tick ONE box in ONE line only)	Less than 1 week	Up to 6 weeks	Up to 3 months	Up to 6 months	Over 6 months
I am still breastfeeding and have breastfed for...					
I have finished breastfeeding and breastfed for...					

23. Did you feed for as long as you would have liked? Yes ☐ No ☐

24. Were you breastfed yourself? Yes ☐ No ☐ Don't know ☐

PLEASE CONTINUE TO QUESTION 25 - WELLBEING SECTION

WELLBEING

25. Below are some statements about feelings and thoughts.
Please tick the box that best describes your experience of each over the last 2 weeks

STATEMENTS	None of the time	Rarely	Some of the time	Often	All of of the time
I've been feeling optimistic about the future	☐	☐	☐	☐	☐
I've been feeling useful	☐	☐	☐	☐	☐
I've been feeling relaxed	☐	☐	☐	☐	☐
I've been feeling interested in other people	☐	☐	☐	☐	☐
I've had energy to spare	☐	☐	☐	☐	☐
I've been dealing with problems well	☐	☐	☐	☐	☐
I've been thinking clearly	☐	☐	☐	☐	☐
I've been feeling good about myself	☐	☐	☐	☐	☐
I've been feeling close to other people	☐	☐	☐	☐	☐
I've been feeling confident	☐	☐	☐	☐	☐
I've been able to make up my own mind about things	☐	☐	☐	☐	☐
I've been feeling loved	☐	☐	☐	☐	☐
I've been interested in new things	☐	☐	☐	☐	☐
I've been feeling cheerful	☐	☐	☐	☐	☐

FOOD

26. a) How many times **a day** do you usually eat fruit? *(Please tick one box only)*

1	2	3	4	5 or more
☐	☐	☐	☐	☐

b) How many times **a day** do you usually eat vegetables? *(Please tick one box only)*

1	2	3	4	5 or more
☐	☐	☐	☐	☐

27. How often do you usually have b**reakfas**t? *(Please tick one box only)*

Every Day	**Twice a a week**	**3-6 times a week**	**Once a week**	**Never**	**If never**
☐	☐	☐	☐	☐ →	**go to Q29**

28. What do you eat for breakfast *(Please tick all that apply)*

Breakfast cereal	☐
Milk	☐
Bread or toast	☐
Fruit juice	☐

Something else (please specify) _____

29. How often do you usually have **lunch** (midday meal)? *(Please tick one box only)*

Every Day	**Twice a a week**	**3-6 times a week**	**Once a week**	**Never**	**If never**
☐	☐	☐	☐	☐→	**go to Q31**

30. Where do you most often buy your lunch?
(Please tick the one option you usually make use of)

canteen	☐
Local shop	☐
Local takeaway	☐
Café/Restaurant/Pub	☐
I bring a packed lunch with me	☐
I go home for lunch	☐

31. How often do you have **a meal in the evening** (tea/dinner/evening meal)? *(Please tick one box only)*

Every Day	**Twice a a week**	**3-6 times a week**	**Once a week**	**Never**	**If never**
☐	☐	☐	☐	☐→	**go to Q35**

32. Who normally prepares your main meal? *(Please tick Yes or No for each line*)

	Yes	No
My parent(s)/guardian(s)/partner cook(s) for me	☐	☐
I cook for myself only in a separate kitchen	☐	☐
I cook for myself only in self catered shared premises	☐	☐
I cook for myself and friends/partner/lodgers only	☐	☐
I cook for myself, partner and children only	☐	☐
I cook for myself and my children only	☐	☐
I live in fully catered accommodation	☐	☐
I tend to eat out	☐	☐

33. What type of food do you **usually** eat for your main meal? *(Please tick one box only)*

Food cooked from fresh ingredients	☐
Pre-pared convenience food	☐
Takeaway food	☐

34. Where do you **usually** eat your main meal? *(Please tick one box only)*

At home at a table	☐
At home in front of the TV	☐
Not at home	☐

35. Apart from your main meals (eg breakfast, lunch, tea/dinner), on average how many times do you have a snack each day consisting of:
(Please tick one box only for each line)

	None	One	Two	Three	More than 3
Chocolate bars/Sweets	☐	☐	☐	☐	☐
Crisps/savoury snacks	☐	☐	☐	☐	☐
Sugary fizzy drinks	☐	☐	☐	☐	☐
Diet/sugar free fizzy drinks	☐	☐	☐	☐	☐
Fruit juice/diluting juice	☐	☐	☐	☐	☐

The following questions are about eating fruits and vegetables every day. We should eat at least 3 fruits a day (like banana, kiwi, strawberry, grapes, etc) and 2 portions of vegetables (like tomato, cucumber, lettuce, carrot, pepper, etc.) at lunch and dinner time. This is called 5 a day!

36. For me, eating '5 a day' every day would be:
(Please tick one box on each line on a scale from 1 to 5)

	1	2	3	4	5	
unpleasant	☐	☐	☐	☐	☐	pleasant
worthless	☐	☐	☐	☐	☐	worthwhile
unhealthy	☐	☐	☐	☐	☐	healthy
stupid	☐	☐	☐	☐	☐	clever

37. I would like to eat '5 a day' every day

	1	2	3	4	5	
disagree	☐	☐	☐	☐	☐	agree

38. Which of these statements would encourage you to eat more healthy food?
(Please tick all that apply)

- Healthy eating is good for my health ☐
- Healthy eating can help me keep a healthy weight ☐
- Healthy eating can help prevent diseases like heart disease and cancer ☐
- Healthy eating is good for my skin ☐
- My parents want me to eat healthy foods ☐
- My friends want me to eat healthy foods ☐

39. Which of these changes would help you to eat more healthy food?
(Please tick one box for each line)

	Very Helpful	**Helpful**	**Not very Helpful**
More information on how to eat a healthy diet	☐	☐	☐
More opportunities to learn how to cook	☐	☐	☐
Clearly labelled healthier choices in canteens	☐	☐	☐
More healthy food choices in vending machines	☐	☐	☐
Being able to taste new products in canteens	☐	☐	☐
More opportunities to cook	☐	☐	☐
More opportunities to choose healthy food	☐	☐	☐
More support from my parents and friends	☐	☐	☐

40. What would **prevent** you from eating healthy food?
(Please tick Yes or No for each line)

	Yes	No
Lack of time	☐	☐
Don't enjoy eating healthy food	☐	☐
Can't always get healthy food	☐	☐
Don't have enough money	☐	☐
Don't enjoy cooking	☐	☐
Don't know how to cook healthy food	☐	☐
Lack of support from my parents	☐	☐
Lack of support from my friends	☐	☐

PHYSICAL ACTIVITY

Physical activity includes sports, recreational activities and general 'active living' but for health purposes it must be performed at a moderate intensity (activity which increases your heart rate, but does not leave you exhausted e.g. brisk walking, cycling, dancing etc.)

41. On how many days per week are you <u>at least</u> moderately physically active for a total of **30 minutes** or more? *(Please tick one box only)*

0-1 day per week	☐
2-4 days per week	☐
5-7 days per week	☐

42. For me, being moderately physically active for 30 minutes on at least 5 days a week is: *(Please tick one box on each line on a scale from 1 to 5)*

	1	2	3	4	5	
difficult	☐	☐	☐	☐	☐	easy
relaxing	☐	☐	☐	☐	☐	stressful
not enjoyable	☐	☐	☐	☐	☐	enjoyable
unhealthy	☐	☐	☐	☐	☐	healthy

43. How confident are you that you can be moderately physically active for 30 minutes on at least 5 days a week? *(Please tick one box on a scale from 1 to 5)*

	1	2	3	4	5	
not very confident	☐	☐	☐	☐	☐	very confident

44. I would like to be moderately physically active for 30 minutes on at least 5 days a week. *(Please tick one box on a scale from 1 to 5)*

	1	**2**	**3**	**4**	**5**	
disagree	☐	☐	☐	☐	☐	agree

45. How many hours **a day** do you usually watch TV? (*Please tick one box only*)

Not at all	☐
Less than half an hour a day	☐
Between 1 and 3 hours	☐
Between 3 and 4 hours	☐
4+ hours	☐

46. How many hours **a day** do you usually spend on a computer/games console? *Please tick one box only*)

Not at all	☐
Less than half an hour a day	☐
Between 1 and 3 hours	☐
Between 3 and 4 hours	☐
4+ hours	☐

47. Would you consider taking more exercise for any of the following reasons? *(Please tick Yes or No for each line)*

	Yes	**No**
To win/compete/for a challenge/to improve performance	☐	☐
To have fun	☐	☐
To improve your health	☐	☐
To improve your appearance	☐	☐
To help you lose weight/maintain a healthy weight	☐	☐
To make you feel fitter	☐	☐
To socialise/make more friends	☐	☐
To help you relax/feel better/less stressed	☐	☐
To please family/friends	☐	☐
To impress	☐	☐
Other	☐	

48. Do the following issues **prevent** you from taking more exercise? *(Please tick Yes or No for each line)*

	Yes	No
Don't like participating with opposite sex	☐	☐
Don't like competitive activities	☐	☐
Lack of privacy in changing rooms	☐	☐
Don't have time to shower after activity	☐	☐
Don't like the choice of activities	☐	☐
None of my friends want to	☐	☐
Not enough teams or activities to join	☐	☐
Exams, assignments take up too much time	☐	☐
Lack of spare time at evenings/weekends	☐	☐
Lack of money	☐	☐
Lack of company, eg. friends	☐	☐
Lack of facilities nearby, eg swimming pool	☐	☐
Lack of transport	☐	☐
Physical disabilities	☐	☐
You don't know what's on	☐	☐
You already take enough exercise	☐	☐
You don't like exercise	☐	☐
Bad weather	☐	
Other	☐	

49. What types of activity would you do if you decided to become more physically active? *(Please tick Yes or No for each line)*

	Yes	No
Competitive sports (football, hockey, squash etc).	☐	☐
Non-competitive sports and activities (forms of recreational cycling and swimming, walking, yoga, dance etc)	☐	☐
Active living (incorporating physical activity into your every day lifestyle: walking/cycling to university or work etc; heavy gardening, housework or DIY, using stairs instead of a lift) etc	☐	☐
Go to a gym	☐	☐

SMOKING

SECTION A

50. To what extent do you agree with the following statements?
(Please tick one box for each statement)

	Strongly agree	**Agree**	**Not sure**	**Disagree**	**Strongly disagree**
People who smoke are damaging their health	☐	☐	☐	☐	☐
Cigarette smoke can damage the health of non-smokers	☐	☐	☐	☐	☐
Cigarette smoke annoys non-smokers	☐	☐	☐	☐	☐
Smoking is an expensive habit	☐	☐	☐	☐	☐
The Tobacco Industry advertises tobacco to encourage young people to smoke	☐	☐	☐	☐	☐
Smoking helps keep weight down	☐	☐	☐	☐	☐
Once people start smoking they are unlikely to stop	☐	☐	☐	☐	☐
Banning smoking in public places encourages people to stop smoking	☐	☐	☐	☐	☐
Shop assistants should ask for ID before selling tobacco to young people	☐	☐	☐	☐	☐

51. How often are you in places where there is smoke from <u>other people</u> smoking tobacco?
(Please tick one box only)

I usually spend most of the day in places where other people are smoking ☐
I often spend some of my day in places where other people are smoking ☐
I am seldom in places where other people are smoking ☐

52. Do any of the following people you know smoke? *(Please tick one box for each line)*

	Yes	No	Doesn't apply
Mother or female guardian	☐	☐	☐
Father or male guardian	☐	☐	☐
Grandmother or grandfather	☐	☐	☐
Brother or sister	☐	☐	☐
Boyfriend or girlfriend	☐	☐	☐
Close friend	☐	☐	☐
Other	☐	☐	☐

53. Which statement **best** describes you? *(Please tick one box only)*

I smoke every day	☐	**Go to Section B**
I smoke socially	☐	
I have given up smoking	☐	
I have only tried smoking once or twice	☐	**Go To Q63**
I have never smoked tobacco	☐	

IF YOU ARE AT PRESENT A NON-SMOKER PLEASE IGNORE SECTION B AND MOVE ON TO THE ALCOHOL SECTION - <u>QUESTION 63</u>

PLEASE ANSWER THE QUESTIONS IN THIS SECTION ONLY IF YOU SMOKE AT PRESENT

<u>SECTION B</u>

54. Thinking of your own smoking habits which of the following statements would you agree with: *(Please tick Yes or No for each statement)*

	Yes	No
I wouldn't consider myself a smoker – I only smoke when I **want to**	☐	☐
I only smoke when I **need to**	☐	☐
I enjoy smoking – I don't want to stop	☐	☐
I'm a smoker- I want to stop but I can't	☐	☐
I only smoke so I can use cannabis	☐	☐
I find it difficult not to smoke when I am drinking alcohol	☐	☐
I find it difficult to smoke because of the smoking ban	☐	☐

55. How old were you when you started smoking?

10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐

Other age ☐

56. In a day, how many cigarettes do you smoke? *(Please tick one box only)*

Less than 1 cigarette a day	☐
1-5 cigarettes a day	☐
6-10 cigarettes a day	☐
11-15 cigarettes a day	☐
16-20 cigarettes a day	☐
More than 20 cigarettes a day	☐

57. Would you say the majority of your friends are: *(Please tick one box only)*

Smokers	☐
Non smokers	☐

58. People smoke for many reasons. Which of the following reasons for smoking apply to you? *(Please tick Yes or No for each line)*

	Yes	**No**
You enjoy the taste	☐	☐
It calms your nerves and helps you relax	☐	☐
You feel smoking relieves boredom	☐	☐
You feel smoking gives you confidence	☐	☐
You smoke because your friends smoke	☐	☐
You feel addicted to smoking	☐	☐
You wanted to try smoking out of curiosity	☐	☐

59. Do you usually smoke in the following places? *(Please tick Yes or No for each line)*

	Yes	**No**
At home	☐	☐
At friend's home	☐	☐
In the street	☐	☐
At parties	☐	☐
At work/university/college	☐	☐
On the way to work/university/college	☐	☐
Outside cafes/pubs/nightclubs	☐	☐
Other	☐	☐

60 Would you like to give up smoking? *(Please tick one box only)*

Yes ☐
No ☐

a) **If Yes**, do you want to give up for any of the following reasons? *(Please tick Yes or No for each line)*

	Yes	**No**
To improve fitness	☐	☐
To prevent disease and ill health	☐	☐
To save money	☐	☐
To be more attractive	☐	☐
To respect the wishes of non-smokers	☐	☐
Other	☐	☐

b) **If No** is it for any of the following reasons?

	Yes	**No**
I smoke to use cannabis	☐	☐
I can stop smoking at any time	☐	☐
I am not ready to stop smoking	☐	☐
I enjoy smoking	☐	☐
My friends smoke	☐	☐

61. In the last year, have you tried to cut down or give up smoking? (*Please tick Yes or No*)

Cut down	Yes	☐	No	☐
Give up	Yes	☐	No	☐

a) If **'you gave up smoking'**, did you get help? *(Please tick Yes or No)*

Yes ☐ No ☐

b) If **'Yes'**, what help did you receive? *(Please tick all that apply)*

Telephone helpline ☐
Advice from website ☐
Advice from tutors/lecturers ☐
Advice from occupational health at work ☐
Advice from youth worker ☐
Advice from GP/practice nurse ☐
Advice from Pharmacist ☐
Contact Smoking Advice Service ☐
Use Nicotine Replacement Therapy ☐
Advice from parents ☐
Advice from friends ☐

c) If **'No'**, can you say why not?

_____

d) If you used Nicotine Replacement Therapy (NRT) did it help you to stop smoking? Yes ☐ No ☐

Where did you get the Nicotine Replacement Therapy from?
(Please tick all that apply)

Parents	☐	GP	☐
Pharmacy	☐	Other	☐

62. If you wanted to stop smoking, what do you think would help you to stop?
(Please tick all that apply)

Making cigarettes more expensive	☐
Attending a specialist stop smoking group	☐
Encouragement and support from friends	☐
A booklet offering advice and practical tips	☐
Telephone helpline/advice line	☐
Encouragement/advice in workplace	☐
Encouragement/advice in university/college	☐
Advice from your doctor or health care worker	☐
Other	☐

ALCOHOL

SECTION A

63. To what extent do you agree with the following statements?
(Please tick one box for each statement)

	Agree	Not sure	Disagree
Drinking too much alcohol can cause health problems	☐	☐	☐
Alcohol is expensive	☐	☐	☐
Drinking alcohol makes people lose control of themselves	☐	☐	☐
Drinking alcohol can lead to unplanned pregnancy or catching sexually transmitted diseases	☐	☐	☐
Drunk people are unpleasant	☐	☐	☐
Drinking alcohol helps people to relax	☐	☐	☐
Alcohol can make people take chances ie drinking and driving	☐	☐	☐
Drinking alcohol is sociable	☐	☐	☐
Drinking alcohol is enjoyable	☐	☐	☐
Drinking alcohol helps people forget their worries	☐	☐	☐
People under 18 should be allowed to buy alcohol	☐	☐	☐
Drinking alcohol makes people violent	☐	☐	☐

64. Have you ever had an alcoholic drink? (Please tick one box only)

Yes ☐ **If YES, please answer the questions in SECTION B Q65**

No ☐ **If NO, please go to Q74**

SECTION B

ANSWER THE FOLLOWING QUESTIONS ONLY IF YOU DRINK ALCOHOLIC

(ALL REPLIES ARE ANONYMOUS)

65. Which of the following statements best applies to you? *(Please tick one box only)*

I have given up alcohol	}	☐ }
Go To Q74		
I drink alcohol once or twice a year	}	☐ }
I drink alcohol less than once a month		☐ **}**
I drink alcohol more than once a month, but not weekly		☐ **}**
I drink alcohol 1 or 2 days a week		☐ **}**
		Go to Q66
I drink alcohol between 3 and 5 days a week		☐ **}**
I drink alcohol 6 or 7 days a week		☐ **}**

66. Do you usually drink in the following places? *(Please tick Yes or No)*

	Yes	**No**
At home with family	☐	☐
At home without family	☐	☐
At home with friends	☐	☐
In the street	☐	☐
At parties	☐	☐
At work	☐	☐
At university/college	☐	☐
In pubs/night-clubs	☐	☐
In restaurants/cafes	☐	☐
Other	☐	

67. There are many reasons why people drink. Do you drink alcohol for any of the following reasons? *(Please tick one box for each reason*

	Yes	No
You like the taste of alcohol	☐	☐
All adults drink	☐	☐
It helps you to relax	☐	☐
You like the way it makes you feel	☐	☐
It helps you to talk to people more easily	☐	☐
You don't want to feel like the 'odd one out' among your friends	☐	☐
Adults find drinking fun	☐	☐
It helps you forget your problems	☐	☐
You want to get drunk	☐	☐
You need a drink to stop shakes, sweats, tremors	☐	☐

68. Have you had an alcoholic drink in the **past 7 days**? *(Please tick one box only)*

Yes	☐	**Complete Q68 by filling in grid below**
No	☐	**Go to Question 69**

If **'Yes'**, please complete the following table to indicate the number of alcoholic drinks you have had on each of the seven days? (Exclude any low-alcohol drinks).

Indicate <u>number</u> of alcoholic drinks or amounts or alcohol drunk eg 1=1 pint 0.5 = half pint

	Mon	Tue	Wed	Thurs	Fri	Sat	Sun
Pints of shandy							
Pints of beer/lager/stout/ cider (normal strength)							
Pints/cans of extra strong beer/ cider (eg special brew, strong white cider)							
Spirits (eg rum, southern comfort, vodka)							
Fortified wine (eg Buckfast)							
Alcopops (eg smirnoff ice, wkd							
Glasses of wine — Large							
Glasses of wine — Small							
Other							

69. Would you like to cut down on the amount of alcohol you drink?

Yes	☐
No	☐

If **'Yes'**, would the following help you to do so? *(Please tick Yes or No for each line)*

	Yes	**No**
Advice and support from family and friends	☐	☐
Advice and support in the workplace eg. Occupational health	☐	☐
Advice and support from your tutors/lecturers	☐	☐
Advice and support from your doctor	☐	☐
Advice from an Alcohol Advisory Group/counselling agency	☐	☐
Leading a less stressful life	☐	☐
More recreation and sports facilities available at reasonable prices	☐	☐
Meeting a new group of friends	☐	☐
Information from Healthpoints	☐	☐
Other	☐	

70. If you buy alcohol, where do you USUALLY buy it? *(Please tick all that apply)*

I never buy alcohol	☐
In a pub or bar	☐
In a club or disco	☐
From an off-licence	☐
From a shop	☐
From a supermarket	☐
From someone else, please write in	☐

.....

From somewhere else, please write in ☐

.....

71. In the past year, as a result of drinking alcohol, have you …?
(Please tick one box for each line)

	No	Once	Twice or more
Had an argument	☐	☐	☐
Had a fight	☐	☐	☐
Visited a hospital A&E department	☐	☐	☐
Been admitted to hospital overnight	☐	☐	☐
Had an injury that needed to be seen by a doctor	☐	☐	☐
Stayed off university/college/work	☐	☐	☐
Been sick (vomited)	☐	☐	☐
Tried any drugs	☐	☐	☐
Been in trouble with the police	☐	☐	☐
Had unprotected sexual intercourse	☐	☐	☐

72. How old were you when you first drank alcohol?

Drank alcohol		I was _____ years old
Got drunk	Never ☐	I was_____years old

73. During the last 30 days (month), how many times did you have five or more drinks on the same occasion? *(Please tick one box only)*

4 or more times	☐
3 times	☐
Twice	☐
Once	☐
I have not had 5 or more drinks on the same occasion in the last 30 days	☐
I have never had 5 or more drinks on the same occasion	☐

SEXUAL HEALTH

74. To what extent do you worry about catching HIV (the cause of AIDS)?
(Please tick one box only)

- A lot ☐
- Quite a lot ☐
- A little ☐
- Not at all ☐

75. Please say whether you agree or disagree with the following statements:
(Please tick one box for each statement)

	Agree	Disagree	Not Sure
A person can get HIV by shaking hands with someone who is HIV positive	☐	☐	☐
A person can get HIV by sharing needles/ syringes with someone who is HIV positive	☐	☐	☐
A person can get HIV by having sexual intercourse with someone who is HIV positive	☐	☐	☐
A pregnant woman who has HIV can pass it on to her baby	☐	☐	☐
A person can get HIV by donating blood	☐	☐	☐
A person can become infected with HIV by sharing a cup or glass with someone who is HIV positive	☐	☐	☐
A person can get HIV by swallowing street drugs	☐	☐	☐
A person can protect themselves from HIV by using condoms every time they have sex	☐	☐	☐
A person can protect themselves from sexually transmitted diseases by using condoms every time they have sex	☐	☐	☐
Taking the contraceptive pill can prevent a person from becoming pregnant and being infected with a sexually transmitted disease	☐	☐	☐

76. Would you feel comfortable discussing questions about sex with?
(Please tick one box for each line)

	Yes	No	Does not apply
Friends	☐	☐	☐
Parents/guardian	☐	☐	☐
Brothers or sisters	☐	☐	☐
Other relatives, ie aunts, uncles	☐	☐	☐
Tutors/lecturers	☐	☐	☐
Occupational health at work	☐	☐	☐
Doctor	☐	☐	☐
Work colleagues	☐	☐	☐
Youth worker	☐	☐	☐
Phone line service	☐	☐	☐
Other	☐		

77. Where do you think contraception e.g. condoms and advice should be available from?
(Please tick all that apply)

In Schools	☐
GP	☐
GUM (sexually transmitted infection clinic)	☐
Family Planning	☐
Libraries	☐
Pharmacy	☐
Community Education	☐
Other	☐

78. Do you know: *(Please tick Yes or No for each line)*

		Yes	No
a)	When you were under 16 you could have got contraceptive advice	☐	☐

b)	That you can get free condoms from:	Yes	No
	GUM clinic (sexually transmitted infection clinic)	☐	☐
	Square 13 (family planning	☐	☐
	Dr Grays (family planning clinic)	☐	☐
	Moray SMS (Healthpoint Elgin)	☐	☐
	Healthpoint (Elgin)	☐	☐
	Some GPs	☐	☐
	Some pharmacies	☐	☐
	Terence Higgins Trust Aberdeen	☐	☐
	Caledonia Youth Aberdeen	☐	☐
	Get rubbered	☐	☐

79. Have you ever heard of these sexually transmitted infections?
(Please tick one box for each line)

	Yes	No	Not Sure
Chlamydia	☐	☐	☐
Genital Warts	☐	☐	☐
Genital Herpes	☐	☐	☐
Gonorrhoea	☐	☐	☐
Syphilis	☐	☐	☐
Hepatitis B	☐	☐	☐
HIV/AID	☐	☐	☐

80. Would you class yourself as:

	Yes	No
Heterosexual	☐	☐
Homosexual – male – (gay)	☐	☐
female – (lesbian)	☐	☐
Bisexual (attracted to both sexes)	☐	☐
Other	☐	☐

Please state

_____

RELATIONSHIPS

81. a) Do you currently have or have had a boyfriend/girlfriend/partner/wife/husband?
(Please tick one box only)

Yes ☐
No ☐

b) Have you ever had sexual intercourse?

Yes ☐ **Go To Q82**
No ☐ **Go To Q86 – drugs section**

PLEASE ANSWER THE FOLLOWING QUESTIONS ONLY IF YOU ANSWERED YES TO Q81 AND YOU HAVE HAD SEXUAL INTERCOURSE

82. How old were you when you first had sexual intercourse?

10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Other Age ☐

83. The **first time** that you had sexual intercourse, did you or your partner use contraception? *(Please tick one box only)*

Yes ☐
No ☐

If **'Yes'**, was it: *(Please tick all that apply)*

Condom ☐
Pill ☐
Condom + other method of contraception ☐
Patch ☐
Implanon Implant (contraceptive rod) ☐
Depo injection ☐
IUD (coil non hormonal) ☐
IUS (coil hormonal) ☐
Emergency contraception (eg morning after pill) ☐
Other ☐

84. **i)** When having sexual intercourse, do you and your partner use contraception?
(Please tick one box only)

- Always ☐
- Nearly Always ☐
- Sometimes ☐
- Never ☐

ii) If you use a contraceptive, which type do you use? *(Please tick all that apply)*

- Condom ☐
- Pill ☐
- Condom + other method of contraception ☐
- Patch ☐
- Implanon Implant (contraceptive rod) ☐
- Depo injection ☐
- IUD (coil non hormonal) ☐
- IUS (coil hormonal) ☐
- Emergency contraception (eg morning after pill) ☐
- Other ☐

85. Have you ever experienced any problems when trying to obtain contraceptives?
(Please tick one box only)

- Yes ☐
- No ☐

a) If **'Yes'**, was it: *(Please tick all that apply)*

- Condom ☐
- Pill ☐
- Patch ☐
- Implanon Implant (contraceptive rod) ☐
- Depo injection ☐
- IUD (coil non hormonal) ☐
- IUS (coil hormonal) ☐
- Emergency contraception (eg morning after pill) ☐
- Other ☐

b) If you had problems obtaining contraception was it because:

- Refusal by GP ☐
- Refusal by clinic doctor ☐
- Other ☐

Please state _____

DRUGS

The following questions are about drugs. By 'drugs' we mean those substances that have NOT been given to you by a doctor or pharmacist for medical reasons. (These substances do not include Alcohol & Tobacco)

86. To what extent do you agree with the following statements?
(Please tick one box for each statement)

	Agree	Uncertain	Disagree
Taking drugs not prescribed by a doctor or pharmacist can cause health problem	☐	☐	☐
Once you start taking drugs regularly It is difficult to stop	☐	☐	☐
Taking drugs makes people lose control of themselves	☐	☐	☐
People who take drugs are unpleasant	☐	☐	☐
Taking drugs is sociable	☐	☐	☐
Some drugs that are illegal should be made legal	☐	☐	☐
There is a safe limit for taking unprescribed drugs	☐	☐	☐
Drugs are safer than alcohol	☐	☐	☐
Taking drugs is good for my image	☐	☐	☐

87. a) Have you ever been offered drugs? *(Please tick one box only)*

Yes ☐
No ☐

b) Have you ever taken or tried drugs? *(Please tick one box only)*

Yes ☐→**Go to Q88**
No ☐→ **IF YOU HAVE NEVER TAKEN ANY 'DRUGS' OR HAVE TAKEN THEM ONLY WHEN PRESCRIBED BY A DOCTOR OR PHARMACIST YOU DO NOT NEED TO ANSWER ANY FURTHER QUESTIONS.**

THANK YOU FOR YOUR HELP

ANSWER THE FOLLOWING QUESTIONS ONLY IF YOU HAVE TAKEN DRUGS

PLEASE REMEMBER ALL REPLIES ARE ANONYMOUS

88. Here is a list of drugs. Being completely honest, please indicate if you have taken any of them before or not. Remember these do not include any occasions when you have been given these drugs by a doctor or pharmacist *(Please tick one box for each line)*

	Never taken	Taken only once or twice ever	Taken less than once a week and more than once a month	1-2 days a week	3 to 6 days a week	Daily
Cannabis (ie. dope, blow)	☐	☐	☐	☐	☐	☐
Amphetamines (ie. speed, whizz)	☐	☐	☐	☐	☐	☐
Magic mushrooms	☐	☐	☐	☐	☐	☐
LSD (acid, tabs)	☐	☐	☐	☐	☐	☐
Ecstasy (E, eccies)	☐	☐	☐	☐	☐	☐
Astrabite (Bite)	☐	☐	☐	☐	☐	☐
Heroin (smack),	☐	☐	☐	☐	☐	☐
Unprescribed DF118's, (dihydrocodeine etc)	☐	☐	☐	☐	☐	☐
Methadone,	☐	☐	☐	☐	☐	☐
Cocaine (Coke)	☐	☐	☐	☐	☐	☐
Temazepam (jellies, Nitrazapam)	☐	☐	☐	☐	☐	☐
Diazepam (valium)	☐	☐	☐	☐	☐	☐
Gas, Glue or other solvents (Tipp-Ex, lighter fluid etc.)	☐	☐	☐	☐	☐	☐
Poppers (Amyl Nitrate)	☐	☐	☐	☐	☐	☐
Crack (Rock, Stone)	☐	☐	☐	☐	☐	☐
Anabolic Steroids (Roids)	☐	☐	☐	☐	☐	☐
Methamphetamine (Crystal Meth)	☐	☐	☐	☐	☐	☐

89. Have you taken drugs for any of the following reasons: *(Please tick Yes or No for each line)*

	Yes	No
You like drugs	☐	☐
You feel that taking drugs is a mature thing to do	☐	☐
Drugs help you relax	☐	☐
You like the way drugs make you feel	☐	☐
Drugs help you talk to other people more easily	☐	☐
You don't want to feel the odd one out	☐	☐
Drugs help you forget your problems	☐	☐
You feel that you are forced to take drugs	☐	☐
Drugs make you dance better	☐	☐
You need drugs to feel 'normal'	☐	☐
You feel unable to stop even if you wanted to	☐	☐

90 Has your knowledge of drugs come from any of the following? *(Please tick all that apply)*

- Friends ☐
- Lecturers ☐
- University/College/Work colleagues ☐
- Knowledge on the street ☐
- Community education/youth worker ☐
- Parents ☐
- Media (TV/newspapers/magazines) ☐
- Visits when you were at school by outside agencies
  - Health Improvement ☐
  - Police ☐
  - Drugs Action ☐
- Leaflets ☐
- Other ☐

91. How easy would it be for you to get illegal drugs if you wanted to? *(Please tick one box only)*

- Very easy ☐
- Fairly easy ☐
- Fairly difficult ☐
- Very difficult ☐
- Impossible ☐
- Don't know ☐

92. If you wanted help to cut down or stop taking drugs who, if any of the following, would you ask for help? *(Please tick Yes or No for each line)*

	Yes	No
Advice and support from family and friends	☐	☐
Advice and support from tutors/lecturers	☐	☐
Advice and support from your doctor	☐	☐
Advice and support from work colleagues/ Occupational heatlh	☐	☐
Other	☐	☐

If **'Other'**, please specify……

93. How old were you when you first used drugs?

I was _____ years old

94. Have you ever injected drugs?

Yes ☐
No ☐

If **YES** was it within the last: *(Please tick one box only)*

Week ☐
Month ☐
Last three months ☐
Last Year ☐
More than a year ☐

THANK YOU FOR YOUR HELP

The information in this questionnaire will ONLY be seen by Research staff and will be kept in the strictest confidence

Appendix 2.4 Invitation letter to participate in the survey

Dear Student

The Grampian Young People's Lifestyle Survey 2007

The University of Aberdeen and NHS Grampian are constantly working towards improving and promoting health in Grampian, and to do this, we need to find out what young people across the area are thinking and doing about their health. We are targeting young people between the ages of 18 and 25 and you have been chosen at random and can help us by completing this survey. It will not take very long and your answers are very important to us.

The survey is **totally anonymous** and your reply will be treated in the **STRICTEST CONFIDENCE.**

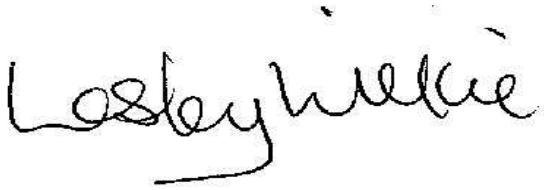
Please complete the survey online at http://www.abdn.ac.uk/websurveys/gyps07/, once you have completed the online questionnaire please press the submit button.

Please complete the online survey by 24 December 2007.

If you have any questions about the survey, please contact Stella McHardy tel. 01224 551836 or by e-mail to s.mchardy@abdn.ac.uk

Thank you for your co-operation, it is very much appreciated.

Yours sincerely



Dr Lesley Wilkie
Director of Public Health

Appendix 2.5 Analysis framework for lifestyle survey

Health behaviour outcomes relevant to the prevention of obesity: Body Mass Index (BMI), general Health, diet and physical activity.

Reasons: BMI is the measure of obesity and perception of the general health by young people is an indication of the understanding of the problem. Diet and physical activity are important indicators of energy balance and in addition the theoretical basis to explore diet and physical activity further was researched and relevant questions were added to the questionnaire.

Socio demographic and lifestyle factors: Gender, Age, Level of Education (Under Grad/Post grad), Area of Education (Science/art etc), Study/Employment status, Living arrangement, Alcohol, Smoking.

Reasons: Gender, Age, Level of Education (Under Grad/Post grad), Area of Education (Science/art etc), Study/Employment status, Living arrangement has been identified to have association with levels of obesity (Swinburn 2005). Alcohol and smoking could be considered both as behaviour outcomes (high calorie intake with alcohol) or as risk factor for obesity. However, the theoretical basis for smoking and alcohol behaviour were not explored and no validated questions based on theory were incorporated into the questionnaire, hence here these were considered as risk factors rather than outcomes.

Basic frequencies of health behaviour outcomes and barriers and facilitators of healthy lifestyle

1. Prevalence of overweight and obesity among the 18-25 year olds according to WHO guidelines
2. Frequency of self reported general health of 18 -25 year olds
3. Frequency of diet behaviour among the 18-25 year olds in terms of the National guidelines
4. Frequency of physical activity behaviour among the 18-25 year olds in terms of the National guidelines
5. Summary of the barriers and facilitators for healthy diet and physical activity behaviour
6. Review frequencies before proceeding to examine associations

Association between health behaviour outcomes and socio demographic and lifestyle factors

The univariate association between each health outcome with all the socio demographic and lifestyle factors will be assessed

	Socio demographic and life style factors								
		Age Ordinal	Gender Binary	Level of education Ordinal	Area of education Nominal	Study/Employment status Nominal	Living arrangement Nominal	Smoking Ordinal	Alcohol Ordinal
Health outcome	BMI Ordinal	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics
	General health Ordinal	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics
	Physical activity Binary	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics
	Diet Binary/ Ordinal*	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics

- * Diet:For fruit and vegetable consumption, it is binary variable and for snacking, it is ordinal variable

Association between the attitude/Intention of young people and the actual behaviour for diet and physical activity

	Fruit eating behaviour (NG) Binary	Veg eating behaviour (NG) Binary	PA behaviour (NG) Binary
Attitudes Ordinal or Nominal	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics
Behavioural intention Ordinal	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics

NG: National Guidelines on eating Fruit and Vegetable and levels of physical activity

Association between barriers/facilitators for the diet and physical activity (PA) behaviour and the demographic factors

Barriers and facilitators will be explored for both diet and physical activity behaviour

	Age Continuous	Gender Binary	Level of Education Ordinal or binary (if under grad or post grad)	Area of education Nominal	Study/Employment status Nominal	Living arrangement Nominal
Barriers (Grouped) Nominal	ANOVA	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics
Facilitators (Grouped) Nominal	ANOVA	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics	Appropriate Chi-squared statistics

Other potential analysis

- Association between meals pattern/snacking and BMI
- Association between physical activity levels and BMI
- Association between perception of general health and BMI
- Association between positive attitudes and intention for healthy diet and BMI
- Association between positive attitudes and intention for PA and BMI

Some kind of Modelling at the end to pull it together

Appendix 2.6 Regrouping/Recoding

The variables in the Grampian lifestyle survey data initially were grouped in a different format to suit the aims of NHS Grampian. Consequently the basic frequencies of all the relevant variables were computed. For this thesis some of the relevant variables needed to be re-coded /regrouped to entirely new variables suitable for analysis to answer the research questions. Some of the questions were not considered for analysis (e.g. ethnic groups) as the numbers were very few. The process of the recoding of relevant questions is detailed below.

DEMOGRAPHICS

Q1. Study/employment status

The young people were asked to tick, if they were: At University, At College, Employed full-time, Employed part-time, Unemployed or long-term sick. They were allowed multiple responses. Consequently all the possible combinations were worked out and then based on the frequency of the individual groups, 5 groups were created.

Single	
University only	955†
College Only	172
Employed Full time (EFT)	172
Employed Part-time (EPT)	236
Unemployed	47
Long-term sick	8
Two Way Combinations	
University and college	4
University and full time Employment	12
University and Part time Employment	157
University and Unemployed	24
University and Long Term sick	2
College and EFT	18
College and EPT	58
College and Unemployed	3
College and Long Term sick	1
EFT and Long-term sick	2
EPT and Long-term sick	1
Unemployed and long-term sick	1
Three way combinations	
University and EFT and Long-term sick	1
University and EPT and Long-term sick	1
University and Unemployed and Long-term sick	0
College and EPT and Long-term sick	1
College and EFT and Long-term sick	1
College and Unemployed and Long-term sick	0
University and College and long-term sick	1
University and College and EPT	2
University and College and Unemployed	0

Regrouped
1 = Student Only ((Students in University or College) or (Students both in University and college and unemployed))
2= Employed (both Fulltime or part-time)
3=Student and Employed (University or college + FT or PT)
4= Others (Unemployed and Long-term sick and/or (University + College+ FT+ PT+ Unemployed))

Q2. Gender

Was not regrouped as existing variable was suitable for analysis

Q3. Age

This was regrouped into 3 categories: The younger (1st and 2nd years) and the middle and the older mature students

Q4. Area of education

Eight study courses were grouped into 4 categories with related subjects

1= Arts (Arts + arts and humanities)

2=Health (Health Related)

3=Science (Social Sciences + Sciences)

4=Others (Divinity, Law and Engineering)

Q5. Ethnicity

The basic frequency of this question on ethnic origin showed that 94% (1230/1307) of the sample were White and all the other ethnic groups accounted for only 6% (77/1307); Missing =6. This pattern observed in young people in Grampian was similar to the ethnic groups at National level among Scottish population according to 2001 census (White British was 95.47%; Indian, Pakistani and Bangladeshi was 0.97%; Chinese was 0.32%; and African, Caribbean and other black population was 0.16%). Hence this variable was not considered for analysis

Q6a. Time lived in Grampian

This question asked how long the participants lived in Grampian Area. Five time periods were regrouped into three.

1 = those who lived in Grampian more than 4 years

2= lived in Grampian for less than 12 months and

3= lived in Grampian between 1-3 years.

Q6b. Majority of time

This question asked where they lived the majority of their life. The options were UK, Europe, North America and other. As the survey was conducted in Grampian, 86% reported in the UK (1116/1295) and another 19% lived in Europe, North America who might be predominantly Caucasians. Only 2.9% lived majority of their life elsewhere. Given this small percentage and no additional information will be provided by the analysis of this question, this was excluded from the analysis

Q7. Current living arrangement

Was not regrouped as existing variable was suitable for analysis

Q8 and 9. Height and Weight

Questions 8 and 9 asked about their height and weight and the BMI was calculated by using the standard formula BMI= Kg/m^2. Then they were grouped into 'Underweight', 'Acceptable weight', 'Overweight' and 'Obese' according to the WHO guidelines

Q10. Deprivation categories

This asked the young people their current postcode. As the student population were mobile and stayed in halls during the student period, it would not give a correct indication of their socio economic status (SES) and consequently their influences on their lifestyle. Hence this question was excluded from the analysis

GENERAL HEALTH

Q11. General Health

As the numbers were fewer in 'poor' and 'very poor' health, this was grouped together to form 4 groups instead of 5 groups

Q13. Weight perception

This question asked if they were overweight, underweight, happy with your body, fit and healthy, worried about gaining weight, unhappy if eat too much and eat a well balanced diet. Each of the statement had an option of 'yes' or 'no'

For this question, initially the first two options was regrouped into 'overweight', 'underweight' and a third category was created as normal (those who selected neither underweight or overweight and the other possible combinations) and the other statements in the same questions were retained as an indication of body perceptions.

No other questions were used from this section

DIET

Diet behaviour (Questions 26, 27, 29, 31, 33 and 35)

Q26a and b: Question on fruit and vegetable consumption (26a and b): The 'Five a day' National guidelines recommend that five portions of fruit and vegetables should be eaten every day in order to reduce the risk of many chronic diseases. However, Q26 a and 26b in the food section, to identify the behaviour of eating fruit and vegetables, asked the participants the number of times they usually ate fruit rather than the portions of fruit. The logic at the time of the questionnaire survey was the limitation of the questionnaire size which did not permit either the explanation of the portion sizes or what constituted 'a portion'. To get an approximation of fruit and vegetable intake, the number of times was asked limiting the interpretation of fruit and vegetable eating behaviour according to the recommended guidelines. Consequently, for the recoding, eating fruits three times a day was regrouped as eating 'adequate fruit' and similarly eating vegetables three times a day was regrouped as eating 'adequate vegetables'. Further these two were combined to get 'overall adequate fruit and vegetables' which would be a mixture of fruits and vegetables eaten six times a day (assuming only one fruit or vegetable is eaten at any one time) which is conservative measure of the fruit and vegetable consumption. Given the limitation of phrasing the question, there was no opportunity to clarify this further.

Q27, 29 and 31: These three questions asked about the frequency of eating breakfast, lunch and dinner in a week. To get the regularity of the meals, those who had breakfast/lunch/dinner either everyday or 3-6 times a week were regrouped into 'regular breakfast' or 'regular lunch' or regular dinner' respectively.

Further a new variable was created to get a regular meal pattern. Those who had regular breakfast/lunch and dinner either everyday or 3-6 times a week were grouped into having a 'regular meal pattern'

Q33: asked about the type of food they ate and was retained as original coding

1=Food prepared from fresh ingredients

2=Pre-prepared convenience food

3= Takeaway food

Q35 asked the participants the number of times they had a snack each day, apart from their main meals. The snacks were divided into chocolate bars/sweets, crisps/savoury snacks, sugary fizzy drinks, diet/sugar free fizzy drinks and fruit juice/diluting juice. Each of this had an option for selecting

none increasing up to having more than 3 snacks. Using 'ntiles' programme, initially, the total number of snacks was calculated. This ranged from 'none' to 'more than 25 snacks' a day irrespective of what they ate. Further these were regrouped into 'low snacking' if they had no snacks or up to 3 snacks a day, 'medium snacking' if they had 4-5 snacks a day, 'high snacking' if they had more than 6 snacks a day.

Diet attitudes and intention (Questions 36 and 37)

Q 36 and Q37: These were validated questions to assess the attitudes and intentions of young people about eating fruits and vegetables every day called '5 a day'. Attitude (Q36) was assessed using 4 concepts – unpleasant/pleasant, worthless/worthwhile, unhealthy/healthy and stupid/clever. These were assessed on a scale from 1 to 5. The coding was retained. However, during analysis if the expected counts in individual cells were small, then the groups 1 and 2 were put together to make the interpretation of the analysis valid. Similarly Q37 asked about the intention of young people to eat '5 a day'. This was coded from 1 (disagree) to 5 (agree). This regrouping was approved by the health psychologists.

Diet facilitators (Questions 38 and 39)

Q38 had six statements and asked the participants which of the statement would encourage them to eat more healthy food. Each statement had an option to tick (see questionnaire). Linking back to the Theory of Planned Behaviour, health behaviour theory that was used for the questionnaire development, two out of six statements related to health (healthy eating is good for my health and healthy eating can help prevent diseases like heart disease and cancer) and two related to appearance (healthy eating is good for my skin and it can help me keep healthy weight) and the other two related to subjective norm (what is expected of them) such as my parents/friends want me to eat healthy foods. Consequently, this question was grouped into three facilitator categories: health, appearance and subjective norm. If both statements were ticked then it was coded 'very encouraging' and coded 'not very encouraging' if it was ticked for one and not for the other. The created 'subjective norm' category was used as a construct in TPB rather than as a facilitator.

Q39 asked participants the changes that would help them to eat more healthy food. This had eight statements each giving them three options to select, which were 'very helpful', 'helpful' and 'not very helpful'. Firstly, the eight statements were grouped into four categories- more opportunities, more information, more support and providing choices. Secondly, very helpful and helpful from each

statement were grouped together and labelled ‘helpful’. This finally gave two codes ’helpful’ and ‘not helpful’.

Further, for categories with one statement (information and support) it was coded ‘Helpful’ and ‘Not helpful’.

Categories *with 2 statements (opportunity) were coded:*

‘Helpful’ if they ticked ’helpful’ to both statements

‘Not helpful’ if they said ‘not helpful’ to both statement

‘Mixed’ if they ticked helpful to one and not helpful to the other.

Similarly for categories *with 4 statements (choices), it was coded*

‘Generally positive’ if they ticked ‘helpful’ to 3 out of 4 statements

‘Generally negative’ if they ticked ‘not helpful’ to 3 out of 4 statements

‘Mixed’ if they ticked ‘helpful’ for 2 and ‘not helpful’ for 2 statements

It was coded as missing’ if >2 statements was missing

Diet barrier (Question 40)

Q40: This question had eight statements and asked of the participants to either tick ‘yes’ or ‘no’ for each of the statement that would prevent them eating healthy diet. The statements were again categorised into barriers for time, access, money, problems with cooking, lack of support and don’t enjoy healthy food. Further, for categories with one statement (time, access, enjoyment and money) it was coded ‘Is a barrier’ and ‘not a barrier’.

Categories *with 2 statements (issues with cooking and support) were coded:*

‘Is a barrier’ if they ticked ’Yes’ to both statements

‘Not a barrier’ if they said ‘no’ to both statement

‘Mixed’ if they ticked ‘yes’ to one and ‘no’ to the other.

PHYSICAL ACTIVITY

Physical activity behaviour (Questions 41, 45 and 46)

Q41: This asked the participants the number of days per week they do PA as recommended by National guidelines. The Department of Health recommends that adults should participate in physical activity for a minimum of 30 minutes every day at least five days or more a week performed at a moderate intensity (activity which increases heart rate but not leave you exhausted). Physical activity

might include sports, recreational activity and general active living. The question asked if they did PA at recommended level on

0-1 day a week

2-4 days a week

5-7 days a week

To see if young people comply with the guidelines, those who did recommended levels of PA up to 4 days week was grouped as 'inadequate exercising' and those that did it on 5-6 days per week was grouped as 'adequate exercise'.

Q45 and 46: These two questions addressed the sedentary behaviour of the participants. It asked the number of hours in a day that the participants either watched TV or spent on computer/games consoles. They had five options and those that did not watch TV at all or for less than half an hour was regrouped as 'Less than half an hour', between 1-3 or 3-4 hours was grouped into '1-4 hours' and those watched for more than 4 hours was retained as '>4 hours'. Similar regrouping was done for the sedentary behaviour spent on computer or games consoles.

Physical Activity attitudes, Intention and Perceived Behavioural Control (Questions 42, 43 and 44)

Q 42: This validated question assessed the attitude of young people about being adequately active (30 minutes of moderate physical activity on at least 5 days a week). Attitude (Q42) was assessed using four concepts – difficult/easy, relaxing/stressful, not enjoyable/enjoyable and unhealthy/healthy. These were assessed on a scale from 1 to 5. The coding was retained. However, during analysis if the expected counts in individual cells were small, then the groups 1 and 2 were put together to make the interpretation of the analysis valid. This regrouping was approved by the health psychologists.

Q43 asked about the confidence of the young people to be moderately physically active. This was coded from 1 (Not very confident) to 5 (Very confident).

Q44 asked about the intention of young people to be physically active. This was coded from 1 (disagree) to 5 (agree).

Physical activity facilitators (Question 47)

Q47 asked the participants if they would consider doing more exercises for any of the 11 reasons that was stated in the question. Each statement had an option to tick either 'yes' or 'no'. Three of the statements related to 'health' (improve health, lose weight or maintain healthy weight, and feel fit), one

related to improving appearance, three statements related to relaxing (have fun, socialise, to relax or feel better), one related to competing (to win), two were related to subjective norm (to please family/friends or to impress) and last one was 'others'. (see appendix 2.3). Apart from the subjective norm statements, rest of them were grouped into four categories: health, appearance, relaxing/socialising and winning. Categories with one statement (appearance and winning) were coded 'important' and 'not important'.

Categories *with 3 statements (health, relaxing) were coded:*

'Strong facilitator' if they ticked 'yes' to all three statements

'Mostly positive' if they ticked 'yes' to 2 out of 3 statements

'Mostly negative' if they ticked 'no' to 2 out of 3 statements

'Not a facilitator' if they had ticked 'no' to all three statements

Physical activity barriers (Question 48)

Q48: This question had 19 statements and asked of the participants to either tick 'yes' or 'no' for each of the statement that would prevent them from taking more exercise. The statements were again grouped into 12 barrier categories: PA with opposite sex, competition, lack of privacy, information, company, facilities, time and money, disability, feel do enough exercise already, bad weather, choice of activities . Further, for categories with one statement (PA with opposite sex, competition, lack of privacy, information and money, disability, feel did enough exercise already, bad weather) it was coded 'Is a barrier' and 'Not a barrier'.

Categories *with 2 statements (choice of activities and lack of facilities) were coded:*

'Is a Barrier' if they ticked 'Yes' to both statements

'Not a barrier' if they said 'no' to both statement

'Mixed' if they ticked 'yes' to one and 'no' to the other.

Categories *with 3 statements (lack of company and time) were coded:*

'Strong facilitator' if they ticked 'yes' to all three statements

'Mostly positive' if they ticked 'yes' to 2 out of 3 statements

'Mostly negative' if they ticked 'no' to 2 out of 3 statements

'Not a facilitator' if they had ticked 'no' to all three statements

Physical activity preferences (Question 49)

Q49: This question asked the participants the type of activity they preferred to become more physically active. It had four components: competitive sports, non competitive sports, active living and go to gym and they were asked to tick ‘yes or ‘no’ for each of the component. The original coding was retained:

1= Preferred

2= Did not prefer

Appendix 3.1 Association between BMI and demographic/lifestyle factors

	BMI CATEGORIES				
DEMOGRAPHIC FACTORS	**Underweight**	**Normal**	**Overweight**	**Obese**	**Significance p-value†**
Age groups					
18-19 yr olds	155 (36.6%)	176 (41.6%)	65 (15.4%)	27 (6.4%)	
20-22 yr olds	165 (29.6%)	272 (48.7%)	84(15.1%)	37 (6.6%)	0.004
23+	59 (25.1%)	101 (43.0%)	50 (21.3%)	25 (10.6%)	
Gender					
Male	80 (25.8%)	141 (45.5%)	60 (19.4%)	29 (9.4%)	
Female	292 (33.2%)	395 (44.9%)	132 (15.0%)	60 (6.8%)	0.034
Employment and study status					
Student	210 (26.0%)	403 (49.8%)	144 (17.8%)	52 (6.4%)	
Employed	85 (59.4%)	37 (25.9%)	13 (9.1%)	8 (5.6%)	<0.001
Student/Employed	69 (31.4%)	93 (42.3%)	36 (16.4%)	22 (10.0%)	
Other	15 (34.9%)	16 (37.2%)	5 (11.6%)	7 (16.3%)	
Level of education					
Foundation	165 (29.2%)	253 (44.8%)	101 (17.9%)	46 (8.1%)	0.043
Undergraduate	108 (27.1%)	206 (51.6%)	59 (14.8%)	26 (6.5%)	
Postgraduate	20 (18.0%)	54 (48.6%)	28 (25.2%)	9 (8.1%)	
Study subject					
Arts	67 (25.7%)	126 (48.3%)	45 (17.2%)	23 (8.8%)	
Health	48 (29.3%)	83 (50.6%)	27 (16.5%)	6 (3.7%)	0.667
Science	111 (26.1%)	204 (47.9%)	78 (18.3%)	33 (7.7%)	
Others	56 (31.1%)	80 (44.4%)	32 (17.8%)	12 (6.7%)	
Living arrangement	37 (28.0%)	53 (40.2%)	24 (18.2%)	18 (13.6%)	0.126
Living alone (all the time)	14 (33.3%)	19 (45.2%)	6 (14.3%)	3 (7.1)	
Living alone from Monday -Friday	327 (31.6%)	473 (45.7%)	169 (16.3%)	67 (6.5%)	
Living with others					
Smoking Status					
Non-smoker	274 (30.8%)	418 (47.0%)	137 (15.4%)	61 (6.9%)	
Less than or equal to 5 a day	41 (29.3%)	63 (45.0%)	25 (17.9%)	11 (7.9%)	0.279
More than 5 a day	62 (33.7%)	68 (37.0%)	37 (20.1%)	17 (9.2%)	
Alcohol					
Low	270 (33.4%)	360 (44.6%)	121 (15.0%)	57 (7.1%)	
Medium	35 (31.0%)	49 (43.4%)	23 (20.4%)	6 (5.3%)	0.127
High	67 (25.1%)	127 (47.6%)	47 (17.6%)	26 (9.7%)	
General Health					
Very good	94 (43.7%)	101 (47.0%)	19 (8.8%)	1 (0.5%)	
Good	197 (30.3%)	313 (48.2%)	96 (14.8%)	44 (6.8%)	
Average	69 (22.9%)	123 (40.9%)	75 (24.9%)	34 (11.3%)	<0.001
Poor	19 (38.8%)	11 (22.4%)	9 (18.4%)	10 (20.4%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted

Appendix 3.2 Association between diet behaviour and demographic/ lifestyle factors

a. With fruit and vegetable consumption

	DIET - FRUIT AND VEGETABLE CONSUMPTION		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Adequate fruit and vegetables**	**Inadequate fruit and vegetables**	**Significance p value†**
Age groups			
18-19 yr olds	208 (47.3%)	232 (52.7%)	
20-22 yr olds	218 (39.5%)	334 (60.5%)	0.102#
23+	96 (42.5%)	130 (57.5%)	
Gender			
Male	126 (39.5%)	193 (60.5%)	
Female	385 (44.2%)	486 (55.8%)	0.166‡
Employment and study status			
Student	355 (44.9%)	436 (55.1%)	
Employed	60 (38.0%)	98 (62.0%)	
Student & Employed	90 (40.5%)	132 (59.5%)	0.265
Others	16 (34.8%)	30 (65.2%)	
Level of education			
Foundation	237 (42.5%)	320 (57.5%)	
Undergraduate	170 (43.4%)	222 (56.6%)	0.512#
Postgraduate	52 (48.6%)	55 (51.4%)	
Study subject			
Arts	126 (48.1%)	136 (51.9%)	
Health	80 (48.8%)	84 (51.2%)	0.002
Science	184 (43.5%)	239 (56.5%)	
Others	50 (30.7%)	113 (69.3%)	
Living arrangement			
Living alone (all the time)	53 (38.4%)	85 (61.6%)	
Living alone from Monday - Friday	17 (43.6%)	22 (56.4%)	0.538
Living with others	449 (43.4%)	586 (56.6%)	
Smoking status			
Non-smoker	408 (45.1%)	496 (54.9%)	
Less than or equal to 5 a day	60 (43.2%)	79 (56.8%)	0.001#
More than 5 a day	52 (30.4%)	119 (69.6%)	
Alcohol			
Low	361 (44.7%)	446 (55.3%)	
Medium	41 (35.7%)	74 (64.3%)	
High	109 (40.8%)	158 (59.2%)	0.162#

† All P values were based on Pearson Chi-square test unless otherwise highlighted
# Linear-by-Linear Association; ‡ Continuity correction(2x2 table)

b. With meal pattern

	DIET - MEAL PATTERN		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Regular**	**Irregular**	**Significance p value†**
Age groups			
18-19 yr olds	263 (55.8%)	208 (44.2%)	
20-22 yr olds	363 (61.3%)	229 (38.7%)	0.195
23+	146 (58.4%)	104 (41.6%)	
Gender			
Male	179 (50.7%)	174 (49.3%)	
Female	578 (62.2%)	351 (37.8%)	<0.001‡
Employment and study status			
Student	555 (64.8%)	301 (35.2%)	
Employed	67 (40.9%)	97 (59.1%)	
Student & Employed	125 (52.5%)	113 (47.5%)	<0.001
Others	25 (46.3%)	29 (53.7%)	
Level of education			
Foundation	350 (57.4%)	260 (42.6%)	
Undergraduate	269 (64.2%)	150 (35.8%)	0.008
Postgraduate	82 (70.7%)	34 (29.3%)	
Study subject			
Arts	170 (59.9%)	114 (40.1%)	
Health	123 (70.7%)	51 (29.3%)	0.051
Science	272 (60.0%)	181 (40.0%)	
Others	107 (58.2%)	77 (41.8%)	
Living arrangement			
Living alone (all the time)	69 (47.6%)	76 (52.4%)	
Living alone from Monday - Friday	26 (56.5%)	20 (43.5%)	0.013
Living with others	673 (60.4%)	442 (39.6%)	
Smoking status			
Non-smoker	620 (64.6%)	340 (35.4%)	
Less than or equal to 5 a day	81 (54.4%)	68 (45.6%)	<0.001
More than 5 a day	70 (35.0%)	130 (65.0%)	
Alcohol			
Low	546 (62.6%)	326 (37.4%)	
Medium	65 (52.0%)	60 (48.0%)	0.001
High	145 (51.1%)	139 (48.9%)	

† All P values were based on Pearson Chi–square test unless otherwise highlighted
‡ Continuity correction(2x2 table)

c. With snacking behaviour

	DIET - *SNACKING BEHAVIOUR*			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Low snacking**	**Medium snacking**	**High snacking**	**Significance p-value†**
Age groups				
18-19 yr olds	119 (27.4%)	135 (31.0%)	181 (41.6%)	
20-22 yr olds	222 (40.0%)	167 (30.1%)	166 (29.9%)	<0.001#
23+	96 (40.0%)	76 (31.7%)	68 (28.3%)	
Gender				
Male	107 (32.6%)	88 (26.8%)	133 (40.5%)	
Female	316 (36.2%)	284 (32.5%)	273 (31.3%)	0.009
Employment and study status				
Student	303 (37.5%)	264 (32.7%)	240 (29.7%)	
Employed	43 (28.7%)	39 (26.0%)	68 (45.3%)	0.002
Student/Employed	74 (33.3%)	57 (25.7%)	91 (41.0%)	
Other	17 (34.0%)	17 (34.0%)	16 (32.0%)	
Level of education				
Foundation				
Undergraduate	184 (32.1%)	164 (28.6%)	225 (39.3%)	
Postgraduate	159 (40.1%)	137 (34.5%)	101(25.4%)	<0.001#
	52 (49.1%)	31 (29.2%)	23 (21.7%)	
Study subject				
Arts	106 (40.0%)	75 (28.3%)	84 (31.7%)	
Health	64 (40.8%)	45 (28.7%)	48 (30.6%)	0.217
Science	154 (35.5%)	152 (35.0%)	128 (29.5%)	
Others	61 (34.9%)	48 (27.4%)	66 (37.7%)	
Living arrangement				
Living alone (all the time)	55 (40.1%)	34 (24.8%)	48 (35.0%)	
Living alone from Monday - Friday	11 (27.5%)	10 (25.0%)	19 (47.5%)	0.176
Living with others	368 (35.1%)	332 (31.7%)	347 (33.1%)	
Smoking status				
Non-smoker	330 (36.8%)	291 (32.4%)	276 (30.8%)	
Less than or equal to 5 a day	63 (45.3%)	38 (27.3%)	38 (27.3%)	<0.001#
More than 5 a day	42 (22.1%)	48 (25.3%)	100 (52.6%)	
Alcohol				
Low	294 (35.9%)	258 (31.5%)	267 (32.6%)	
Medium	38 (32.8%)	38 (32.8%)	40 (34.5%)	0.642#
High	91 (34.3%)	75 (28.3%)	99 (37.4%)	

† All P values were based on Pearson Chi–square test unless otherwise highlighted
# Linear-by-Linear Association

Appendix 3.3 Association between physical activity behaviour and demographic and Lifestyle factors

a. With exercise

	PA - EXERCISE LEVELS		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Adequate exercise**	**Inadequate exercise**	**Significance p value†**
Age groups			
18-19 yr olds	142 (30.4%)	325 (69.6%)	
20-22 yr olds	166 (28.1%)	424 (71.9%)	0.298
23+	61 (24.9%)	184 (75.1%)	
Gender			
Male	135 (38.7%)	214 (61.3%)	<0.001‡
Female	229 (24.8%)	694 (75.2%)	
Employment and study status			
Student	249 (29.2%)	603 (70.8%)	
Employed	52 (31.9%)	111 (68.1%)	
Student & Employed	54 (22.9%)	182 (77.1%)	0.176
Others	13 (26.0%)	37 (74.0%)	
Level of education			
Foundation	173 (28.5%)	433 (71.5%)	
Undergraduate	115 (27.6%)	302 (72.4%)	0.944
Postgraduate	32 (28.1%)	82 (71.9%)	
Study subject			
Arts	67 (23.7%)	216 (76.3%)	
Health	63 (36.6%)	109 (63.4%)	0.032
Science	130 (28.8%)	322 (71.2%)	
Others	51 (28.2%)	130 (71.8%)	
Living arrangement			
Living alone (all the time)	29 (20.4%)	113 (79.6%)	
Living alone from Monday - Friday	14 (30.4%)	32 (69.6%)	0.088
Living with others	323 (29.2%)	784 (70.8%)	
Smoking status			
Non-smoker	283 (29.7%)	670 (70.3%)	
Less than or equal to 5 a day	35 (23.6%)	113 (76.4%)	0.135
More than 5 a day	48 (24.4%)	149 (75.6%)	
Alcohol			
Low	249 (28.8%)	615 (71.2%)	
Medium	35 (28.2%)	89 (71.8%)	0.955
High	79 (27.9%)	204 (72.1%)	

† All P values were based on Pearson Chi–square test unless otherwise highlighted
‡ Continuity correction (2x2 table)

b. With TV watching - sedentary behaviour

	PA - *SEDENTARY BEHAVIOUR – TV WATCHING*			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**< half an hour a day**	**1 to 4 hours /day**	**>4 hrs a day**	**Significance p-value†**
Age groups				
18-19 yr olds	159 (33.8%)	275 (58.5%)	36 (7.7%)	
20-22 yr olds	187 (31.7%)	363 (61.5%)	40 (6.8%)	0.130
23+	62 (24.9%)	164 (65.9%)	23 (9.2%)	
Gender				
Male	125 (35.4%)	195 (55.2%)	33 (9.3%)	
Female	271 (29.2%)	593 (64.0%)	63 (6.8%)	0.014
Employment and study status				
Student	296 (34.7%)	507 (59.4%)	51 (6.0%)	
Employed	19 (11.6%)	132 (80.5%)	13 (7.9%)	<0.001
Student/Employed	79 (33.3%)	134 (56.5%)	24 (10.1%)	
Other	14 (26.4%)	28 (52.8%)	11 (20.8%)	
Level of education				
Foundation	226 (37.2%)	326 (53.6%)	56 (9.2%)	
Undergraduate	130 (31.0%)	270 (64.4%)	19 (4.5%)	0.001
Postgraduate	31 (27.0%)	76 (66.1%)	8 (7.0%)	
Study subject				
Arts	118 (41.8%)	140 (49.6%)	24 (8.4%)	
Health	52 (29.9%)	114 (65.5%)	8 (4.6%)	
Science	148 (32.7%)	273 (60.4%)	31 (6.9%)	0.027
Others	59 (32.1%)	111 (60.3%)	14 (7.6%)	
Living arrangement				
Living alone (all the time)	47 (32.9%)	83 (58.0%)	13 (9.1%)	
Living alone from Monday - Friday	14 (30.4%)	29 (63.0%)	3 (6.5%)	0.909
Living with others	345 (31.0%)	686 (61.6%)	82 (7.4%)	
Smoking status				
Non-smoker	311 (32.5%)	584 (61.1%)	61 (6.4%)	
Less than or equal to 5 a day	59 (39.6%)	77 (51.7%)	13 (8.7%)	<0.001
More than 5 a day	36 (18.0%)	139 (69.5%)	25 (12.5%)	
Alcohol				
Low	273 (31.1%)	529 (60.7%)	69 (7.9%)	
Medium	38 (30.6%)	77 (62.1%)	9 (7.3%)	0.854
High	84 (29.6%)	182 (64.1%)	18 (6.3%)	

† All P values were based on Pearson Chi–square test unless otherwise highlighted

c. With computer/games console - sedentary behaviour

	SEDENTARY BEHAVIOUR – COMPUTER/GAMES CONSOLE			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**< half an hour a day**	**1 to 4 hours /day**	**>4 hrs a day**	**Significance p-value†**
Age groups				
18-19 yr olds	186 (39.7%)	224 (47.8%)	59 (12.6%)	
20-22 yr olds	255 (43.4%)	260 (44.2%)	73 (12.4%)	0.007
23+	107 (43.1%)	91 (36.7%)	50 (20.2%)	
Gender				
Male	106 (30.2%)	174 (49.6%)	71 (20.2%)	<0.001
Female	429 (46.4%)	390 (42.2%)	106 (11.5%)	
Employment and study status				
Student	334 (39.3%)	404 (47.5%)	112 (13.2%)	
Employed	98 (59.8%)	48 (29.3%)	18 (11.0%)	<0.001
Student/Employed	96 (40.5%)	102 (43.0%)	39 (16.5%)	
Other	20 (37.7%)	20 (37.7%)	13 (24.5%)	
Level of education				
Foundation	228 (37.7%)	281 (46.5%)	95 (15.7%)	
Undergraduate	181 (43.3%)	199 (47.6%)	38 (9.1%)	<0.001
Postgraduate	43 (37.1%)	42 (36.2%)	31 (26.7%)	
Study subject				
Arts	112 (40.0%)	130 (46.4%)	38 (13.6%)	
Health	83 (48.0%)	74 (42.8%)	16 (9.2%)	
Science	154 (34.1%)	222 (49.2%)	75 (16.6%)	0.024
Others	81 (44.0%)	76 (41.3%)	27 (14.7%)	
Living arrangement				
Living alone (all the time)	64 (44.8%)	56 (39.2%)	23 (16.1%)	
Living alone from Monday - Friday	15 (32.6%)	20 (43.5%)	11 (23.9%)	0.180
Living with others	465 (41.9%)	497 (44.8%)	147 (13.3%)	
Smoking status				
Non-smoker	382 (40.0%)	436 (45.6%)	138 (14.4%)	
Less than or equal to 5 a day	64 (43.5%)	59 (40.1%)	24 (16.3%)	0.054
More than 5 a day	100 (50.5%)	78 (39.4%)	20 (10.1%)	
Alcohol				
Low	360 (41.5%)	386 (44.5%)	122 (14.1%)	
Medium	47 (37.6%)	62 (49.6%)	16 (12.8%)	
High	128 (45.4%)	116 (41.1%)	38 (13.5%)	0.559

† All P values were based on Pearson Chi–square test unless otherwise highlighted

Appendix 3.4 Association between general health and demographic/lifestyle factors

	GENERAL HEALTH				
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Very good**	**Good**	**Average**	**Poor**	**Significance p-value†**
Age groups					
18-19 yr olds	91 (19.4%)	230 (48.9%)	127 (27.0%)	22 (4.7%)	
20-22 yr olds	111 (18.8%)	325 (54.9%)	139 (23.5%)	17 (2.9%)	
23+	34 (13.7%)	142 (57.0%)	60 (24.1%)	13 (5.2%)	0.099
Gender					
Male	74 (21.0%)	191 (54.1%)	71 (20.1%)	17 (4.8%)	
Female	157 (16.9%)	489 (52.8%)	246 (26.5%)	35 (3.8%)	0.062
Employment and study status					
Student	165 (19.3%)	461 (54.0%)	203(23.8%)	25 (2.9%)	
Employed	34 (20.7%)	87 (53.0%)	37 (22.6%)	6 (3.7%)	
Student/Employed	32 (13.4%)	120 (50.4%)	73 (30.7%)	13 (5.5%)	<0.001
Other	5 (9.3%)	29 (53.7%)	12 (22.2%)	8 (14.8%)	
Level of education					
Foundation	91 (14.9%)	324 (53.2%)	169 (27.8%)	25 (4.1%)	
Undergraduate	84 (20.1%)	225 (53.8%)	98 (23.4%)	11 (2.6%)	0.159
Postgraduate	21 (18.1%)	65 (56.0%)	24 (20.7%)	6 (5.2%)	
Study subject					
Arts	34 (12.0%)	161 (56.9%)	70 (24.7%)	18 (6.4%)	
Health	47 (27.0%)	82 (47.1%)	42 (24.1%)	3 (1.7%)	<0.001
Science	65 (14.4%)	244 (54.0%)	128 (28.3%)	15 (3.3%)	
Others	43 (23.4%)	99 (53.8%)	36 (19.6%)	6 (3.3%)	
Living arrangement					
Living alone (all the time)	25 (17.2%)	67 (46.2%)	45 (31.0%)	8 (5.5%)	
Living alone from Monday -Friday	9 (19.6%)	22 (47.8%)	13 (28.3%)	2 (4.3%)	0.419
Living with others	202 (18.1%)	605 (54.4%)	265 (23.8%)	41 (3.7%)	
Smoking status					
Non-smoker	205 (21.4%)	521 (54.4%)	201 (21.0%)	31 (3.2%)	
Less than or equal to 5 a day	19 (12.8%)	83 (55.7%)	39 (26.2%)	8 (5.4%)	
More than 5 a day	11 (5.5%)	91 (45.5%)	85 (42.5%)	13 (6.5%)	<0.001
Alcohol					
Low	172 (19.7%)	465 (53.4%)	197 (22.6%)	37 (4.2%)	
Medium	16 (12.8%)	68 (54.4%)	39 (31.2%)	2 (1.6%)	0.056
High	43 (15.2%)	146 (51.6%)	81 (28.6%)	13 (4.6%)	

† All P values were based on Pearson Chi–square test

Appendix 4.1 Association between diet attitudes (fruit and vegetables) and demographic/ lifestyle factors

a. Unpleasant/pleasant

DEMOGRAPHIC AND LIFESTYLE FACTORS	**Attitude to eat 'Five-a Day' (fruit and vegetables)**					
	Unpleasant	**2**	**3**	**4**	**Pleasant**	**Significance p-Value†**
Age groups						
18-19 yr olds	19 (4.1%)	27 (5.8%)	81 (17.3%)	98 (21.0%)	242 (51.8%)	
20-22 yr olds	17 (2.9%)	19 (3.2%)	89 (15.1%)	119 (20.2%)	346 (58.6%)	0.304
23+	8 (3.2%)	10 (4.0%)	37 (14.8%)	46 (18.4%)	149 (59.6%)	
Gender						
Male	17 (4.8%)	20 (5.7%)	66 (18.8%)	69 (19.7%)	179 (51.0%)	0.026
Female	25 (2.7%)	35 (3.8%)	135 (14.6%)	191(20.6%)	539 (58.3%)	
Employment and study status						
Student	23 (2.7%)	29 (3.4%)	126 (14.7%)	164 (19.2%)	513 (60.0%)	
Employed	5 (3.1%)	11 (6.9%)	30 (18.8%)	41 (25.6%)	73 (45.6%)	
Student & Employed	10 (4.2%)	14 (5.9%)	40 (16.8%)	51 (21.4%)	123 (51.7%)	0.002
Others	6 (11.3%)	2 (3.8%)	11 (20.8%)	7 (13.2%)	27 (50.9%)	
Level of education						
Foundation	29 (4.8%)	30 (4.9%)	109 (17.9%)	117 (19.2%)	324 (53.2%)	
Undergraduate	6 (1.4%)	16 (3.8%)	52 (12.4%)	86 (20.5%)	259 (61.8%)	0.014
Postgraduate	4 (3.4%)	2 (1.7%)	18 (15.5%)	22 (19.0%)	70 (60.3%)	
Study subject						
Arts	6 (2.1%)	7 (2.5%)	40 (14.1%)	69 (24.3%)	162 (57.0%)	
Health	4 (2.3%)	12 (6.9%)	20 (11.5%)	31 (17.8%)	107 (61.5%)	0.043
Science	16 (3.5%)	16 (3.5%)	69 (15.3%)	79 (17.5%)	272 (60.2%)	
Others	8 (4.3%)	11 (6.0%)	35 (19.0%)	41 (22.3%)	89 (48.4%)	
Living arrangement						
Living alone (all the time)	5 (3.4%)	6 (4.1%)	22 (15.2%)	31 (21.4%)	81 (55.9%)	0.727
Living alone from Monday -Friday	3 (6.5%)	3 (6.5%)	11 (23.9%)	7 (15.2%)	22 (47.8%)	
Living with others	35 (3.2%)	47 (4.2%)	174 (15.7%)	225 (20.3%)	628 (56.6%)	
Smoking status						
Non-smoker	32 (3.4%)	35 (3.7%)	150 (15.7%)	193 (20.2%)	545 (57.1%)	
Less than or equal to 5 a day	1 (0.7%)	8 (5.4%)	15 (10.1%)	29 (19.5%)	96 (64.4%)	0.011
More than 5 a day	11 (5.5%)	13 (6.5%)	40 (20.1%)	41 (20.6%)	94 (47.2%)	
Alcohol						
Low	29 (3.3%)	36 (4.2%)	143 (16.5%)	167 (19.3%)	492 (56.7%)	
Medium	5 (4.0%)	5 (4.0%)	18 (14.5%)	36 (29.0%)	60 (48.4%)	0.402
High	8 (2.8%)	14 (4.9%)	40 (14.1%)	57 (20.1%)	165 (58.1%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted;

b. Worthless/worthwhile

DEMOGRAPHIC AND LIFESTYLE FACTORS	**Attitude to eat 'Five-a Day' (fruit and vegetables)**					
	Worthless	**2**	**3**	**4**	**Worthwhile**	**Significance p-Value†**
Age groups						
18-19 yr olds	10 (2.2%)	15 (3.2%)	41 (8.9%)	79 (17.1%)	318 (68.7%)	
20-22 yr olds	6 (1.0%)	10 (1.7%)	40 (6.8%)	94 (16.0%)	438 (74.5%)	0.360
23+	3 (1.2%)	5 (2.0%)	21 (8.4%)	36 (14.4%)	185 (74.0%)	
Gender						
Male	8 (2.3%)	14 (4.0%)	43 (12.4%)	56 (16.1%)	227 (65.2%)	<0.001
Female	10 (1.1%)	14 (1.5%)	55 (6.0%)	151 (16.4%)	692 (75.1%)	
Employment and study status						
Student	22 (2.6%)		65 (7.6%)	116 (13.6%)	649 (76.2%)	
Employed	7 (4.4%)		15 (9.4%)	38 (23.9%)	99 (62.3%)	
Student & Employed	13 (5.5%)		17 (7.2%)	44 (18.6%)	162 (68.3%)	<0.001
Others	7 (13.2%)		5 (9.4%)	11 (20.8%)	30 (56.6%)	
Level of education						
Foundation	14 (2.3%)	20 (3.3%)	56 (9.3%)	97 (16.0%)	418 (69.1%)	
Undergraduate	3 (0.7%)	7 (1.7%)	25 (6.0%)	64 (15.3%)	319 (76.3%)	0.037
Postgraduate	0 (0%)	1 (0.9%)	8 (6.9%)	16 (13.8%)	91 (78.4%)	
Study subject						
Arts	3 (1.1%)		24 (8.5%)	47 (16.6%)	209 (73.9%)	
Health	11 (6.3%)		9 (5.2%)	25 (14.4%)	129 (74.1%)	
Science	12 (2.7%)		30 (6.7%)	68 (15.1%)	339 (75.5%)	0.016
Others	13 (7.1%)		16 (8.7%)	31 (16.9%)	123 (67.2%)	
Living arrangement						
Living alone (all the time)	2 (1.4%)	3 (2.1%)	8 (5.5%)	27 (18.6%)	105 (72.4%)	0.622
Living alone from Monday -Friday	0 (0%)	1 (2.2%)	7 (15.6%)	8 (17.8%)	29 (64.4%)	
Living with others	16 (1.4%)	26 (2.4%)	87 (7.9%)	174 (15.7%)	802 (72.6%)	
Smoking status						
Non-smoker	34 (3.6%)		76 (8.0%)	153 (16.1%)	689 (72.4%)	
Less than or equal to 5 a day	2 (1.4%)		5 (3.4%)	22 (14.9%)	119 (80.4%)	0.025
More than 5 a day	13 (6.6%)		20 (10.2%)	34 (17.3%)	130 (66.0%)	
Alcohol						
Low	10 (1.2%)	18 (2.1%)	70 (8.1%)	135 (15.6%)	630 (73.0%)	
Medium	2 (1.6%)	2 (1.6%)	13 (10.5%)	26 (21.0%)	81 (65.3%)	0.383
High	6 (2.1%)	8 (2.8%)	15 (5.3%)	46 (16.3%)	207 (73.4%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted

c. Unhealthy/healthy

DEMOGRAPHIC AND LIFESTYLE FACTORS	**Attitude to eat 'Five-a Day' (fruit and vegetables)**					
	Unhealthy	**2**	**3**	**4**	**Healthy**	**Significance p-Value†**
Age groups						
18-19 yr olds	5 (1.1%)	6 (1.3%)	13 (2.8%)	50 (10.8%)	391 (84.1%)	
20-22 yr olds	3 (0.5%)	1 (0.2%)	10 (1.7%)	63 (10.8%)	509 (86.9%)	0.094
23+	1 (0.4%)	3 (1.2%)	12 (4.8%)	23 (9.2%)	211 (84.4%)	
Gender						
Male	7 (2.0%)		17 (4.9%)	42 (12.1%)	281 (81.0%)	
Female	10 (1.1%)		14 (1.5%)	93 (10.1%)	806 (87.3%)	0.001
Employment and study status						
Student	7 (0.8%)		25 (2.9%)	71 (8.4%)	746 (87.9%)	
Employed	4 (2.5%)		3 (1.9%)	32 (19.8%)	123 (75.9%)	<0.001€
Student & Employed	6 (2.5%)		6 (2.5%)	23 (9.7%)	202 (85.2%)	
Others	2 (3.8%)		1 (1.9%)	10 (19.2%)	39 (75.0%)	
Level of education						
Foundation	15 (2.5%)		20 (3.3%)	61 (10.0%)	511 (84.2%)	0.098
Undergraduate	2 (0.5%)		8 (1.9%)	39 (9.4%)	365 (88.2%)	
Postgraduate	0 (0%)		3 (2.6%)	12 (10.4%)	100 (87.0%)	
Study subject						
Arts	1 (0.4%)		7 (2.5%)	29 (10.4%)	243 (86.8%)	
Health	3 (1.7%)		5 (2.9%)	12 (6.9%)	154 (88.5%)	
Science	5 (1.1%)		10 (2.2%)	41 (9.1%)	393 (87.5%)	0.254
Others	5 (2.7%)		6 (3.3%)	25 (13.7%)	147 (80.3%)	
Living arrangement						
Living alone (all the time)	0 (0%)	0 (0%)	4 (2.8%)	14 (9.8%)	125 (87.4%)	
Living alone from Monday -Friday	1 (2.2%)	0 (0%)	1 (2.2%)	6(13.0%)	38 (82.6%)	0.791
Living with others	8 (0.7%)	10 (0.9%)	30 (2.7%)	116 (10.5%)	941 (85.2%)	
Smoking status						
Non-smoker	11 (1.2%)		22 (2.3%)	103 (10.8%)	814 (85.7%)	
Less than or equal to 5 a day	0 (0%)		2 (1.4%)	7 (4.7%)	139 (93.9%)	<0.001#
More than 5 a day	8 (4.0%)		10 (5.0%)	26 (13.1%)	155 (77.9%)	
Alcohol						
Low	7 (0.8%)	5 (0.6%)	24 (2.8%)	97 (11.2%)	730 (84.6%)	
Medium	1 (0.8%)	2 (1.6%)	0 (0%)	17 (13.7%)	104 (83.9%)	0.149
High	0 (0%)	2 (0.7%)	7 (2.5%)	21 (7.4%)	252 (89.4%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted
# Fisher's exact test
€ >20% of the cells had an expected count less than 5 in spite of the grouping. Fisher's exact test did not converge

d. Stupid/clever

DEMOGRAPHIC AND LIFESTYLE FACTORS	**Attitude to eat 'Five-a Day' (fruit and vegetables)**					
	Stupid	**2**	**3**	**4**	**Clever**	**Significance p-Value†**
Age groups						
18-19 yr olds	10 (2.2%)	7 (1.5%)	40 (8.7%)	70 (15.2%)	333 (72.4%)	
20-22 yr olds	4 (0.7%)	3 (0.5%)	38 (6.5%)	101(17.3%)	439 (75.0%)	0.042
23+	2 (0.8%)	3 (1.2)	24 (9.6%)	27 (10.8%)	194 (77.6%)	
Gender						
Male	10 (2.9%)	7 (2.0%)	50 (14.4%)	52 (15.0%)	228 (65.7%)	<0.001
Female	5 (0.5%)	5 (0.5%)	46 (5.0%)	145 (15.8%)	716 (78.1%)	
Employment and study status						
Student	14 (1.7%)		65 (7.7%)	121 (14.3%)	648 (76.4%)	
Employed	3 (1.9%)		7 (4.4%)	36 (22.6%)	113 (71.1%)	<0.002
Student & Employed	9 (3.8%)		21 (8.9%)	31 (13.2%)	174 (74.0%) 30 (57.7%)	
Others	3 (5.8%)		9 (17.3%)	10 (19.2%)		
Level of education						
Foundation	12 (2.0%)	9 (1.5%)	59 (9.8%)	89 (14.8%)	433 (71.9%)	
Undergraduate	3 (0.7%)	3 (0.7%)	23 (5.5%)	63 (15.2%)	323 (77.8%)	0.076
Postgraduate	0 (0%)	0 (0%)	10 (8.6%)	17 (14.7%)	89 (76.7%)	
Study subject						
Arts	2 (0.7%)		27 (9.6%)	41 (14.6%)	210 (75.0%)	
Health	2 (1.2%)		11 (6.4%)	20 (11.6%)	140 (80.9%)	
Science	8 (1.8%)		30 (6.7%)	77 (17.2%)	333 (74.3%)	0.009
Others	10 (5.5%)		19 (10.4%)	25 (13.7%)	128 (70.3%)	
Living arrangement						
Living alone (all the time)	0 (0%)	1 (0.7%)	10 (6.9%)	16 (11.1%)	117 (81.3%)	0.504
Living alone from Monday -Friday	1 (2.2%)	0 (0%)	4 (8.7%)	10 (21.7%)	31 (67.4%)	
Living with others	14 (1.3%)	12 (1.1%)	88 (8.0%)	172 (15.7%)	812 (74.0%)	
Smoking status						
Non-smoker	21 (2.2%)		73 (7.7%)	151 (15.9%)	702 (74.1%)	
Less than or equal to 5 a day	0(0%)		7 (4.7%)	18 (12.1%)	124 (83.2%)	0.034
More than 5 a day	8 (4.1%)		21 (10.8%)	29 (14.9%)	137 (70.3%)	
Alcohol						
Low	11 (1.3%)	6 (0.7%)	56 (6.5%)	139 (16.2%)	646 (75.3%)	
Medium	2 (1.6%)	1 (0.8%)	13 (10.5%)	20 (16.1%)	88 (71.0%)	0.356
High	2 (0.7%)	5 (1.8%)	27 (9.6%)	38 (13.5%)	209 (74.4%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted

Appendix 4.2 Association between diet attitudes and diet intention towards eating 'five a day'

Diet attitude	Diet intention (Five-a-day: fruit and vegetables)					
	No intention	**2**	**3**	**4**	**Strong intention**	**Significance p value†**
Unpleasant	34 (34%)		20 (20%)	12 (12.0%)	34 (34.0%)	
and 2						
3	11 (5.3%)		44 (21.4%)	64 (31.1%)	87 (42.2%)	<0.001
4	6 (2.3%)		12 (4.6%)	91 (34.6%)	154 (58.6%)	
Pleasant	3 (0.4%)		4 (0.5%)	31 (4.2%)	692 (94.8%)	
Worthless and	24 (49.0%)		10 (20.4%)	3 (6.1%)	12 (24.5%)	
2						
3	11 (10.9%)		38 (37.6%)	28 (27.7%)	24 (23.8%)	<0.001
4	9 (4.3%)		21 (10.0%)	100 (47.8%)	79 (37.8%)	
Worthwhile	10 (1.1%)		11 (1.2%)	66 (7.1%)	849 (90.7%)	
Unhealthy and	14 (73.7%)		3 (15.8%)	0 (0%)	2 (10.5%)	
2						<0.001€
3	8 (23.5%)		16 (47.1%)	4 (11.8%)	6 (17.6%)	
4	10 (7.4%)		25 (18.4%)	73 (53.7%)	28 (20.6%)	
Healthy	21 (1.9%)		37 (3.3%)	121 (11.0%)	926 (83.8%)	
Stupid and 2	19 (65.5%)		3 (10.3%)	1 (3.4%)	6 (20.7%)	
3	14 (14.0%)		38 (38.0%)	22 (22.0%)	26 (26.0%)	<0.001€
4	5 (2.5%)		20 (10.1%)	99 (50.0%)	74 (37.4%)	
Clever	14 (1.5%)		19 (2.0%)	75 (7.8%)	854 (88.8%)	

† Pearson Chi-squared test; € >20% of the cells had an expected count less than 5 in spite of the grouping. Fisher's exact test did not converge

Appendix 4.3 Association between diet subjective norm and demographic/lifestyle factors

	DIET -SUBJECTIVE NORM		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Important**	**Not very important**	**Significance p value†**
Age groups			
18-19 yr olds	33 (36.3%)	58 (63.7%)	
20-22 yr olds	43 (44.3%)	54 (55.7%)	0.257
23+	18 (51.4%)	17 (48.6%)	
Gender			
Male	25 (40.3%)	37 (59.7%)	0.880‡
Female	66 (42.0%)	91 (58.0%)	
Employment and study status			
Student	64 (43.5%)	83 (56.5%)	
Employed	10 (31.3%)	22 (68.8%)	
Student & Employed	15 (46.9%)	17 (53.1%)	0.579
Others	5 (41.7%)	7 (58.3%)	
Level of education			
Foundation	41 (37.3%)	69 (62.7%)	
Undergraduate	36 (51.4%)	34 (48.6%)	0.029
Postgraduate	1 (11.1%)	8 (88.9%)	
Study subject			
Arts	17 (34.0%)	33 (66.0%)	
Health	25 (54.3%)	21 (45.7%)	0.080
Science	19 (31.1%)	42 (68.9%)	
Others	9 (42.9%)	12 (57.1%)	
Living arrangement			
Living alone (all the time)	8 (50.0%)	8 (50.0%)	
Living alone from Monday -Friday	5 (41.7%)	7 (58.3%)	
Living with others	81 (41.5%)	114 (58.5%)	0.804
Smoking status			
Non-smoker	70 (42.2%)	96 (57.8%)	
Less than or equal to 5 a day	9 (39.1%)	14 (60.9%)	0.932
More than 5 a day	15 (44.1%)	19 (55.9%)	
Alcohol			
Low	61 (42.4%)	83 (57.6%)	
Medium	13 (50.0%)	13 (50.0%)	0.416
High	17 (34.7%)	32 (65.3%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

Appendix 4.4 Association between diet subjective norm and diet intention towards eating 'five a day'

Diet Subjective Norm	**Diet intention (Five-a-day: fruit and vegetables)**					
	No intention	**2**	**3**	**4**	**Strong intention**	**Significance p value †**
Encouraging	1 (1.1%)		1 (1.1%)	6 (6.4%)	86 (91.5%)	0.006€
Not encouraging	5 (3.9%)		14 (10.9%)	14 (10.9%)	96 (74.4%)	

† Pearson Chi-squared test; € >20% of the cells had an expected count less than 5 in spite of the grouping. Fisher's exact test did not converge

Appendix 4.5 Association between diet intention (fruit and vegetables) and demographic/lifestyle factors

DEMOGRAPHIC AND LIFESTYLE FACTORS	**Diet intention to eat 'Five-a Day' (fruit and vegetables)**					
	Disagree	**2**	**3**	**4**	**Agree**	**Significance p-Value†**
Age groups						
18-19 yr olds	15 (3.2%)	14 (3.0%)	35 (7.5%)	77 (16.5%)	326 (69.8%)	
20-22 yr olds	4 (0.7%)	10 (1.7%)	31 (5.3%)	89 (15.1%)	456 (77.3%)	
23+	3 (1.2%)	8 (3.3%)	15 (6.1%)	32 (13.0%)	188 (76.4%)	0.018
Gender						
Male	15 (4.2%)	19 (5.4%)	33 (9.3%)	43 (12.2%)	243 (68.8%)	
Female	6 (0.7%)	12 (1.3%)	44 (4.8%)	154 (16.7%)	704 (76.5%)	<0.001
Employment and study status						
Student	28 (3.3%)		43 (5.1%)	123 (14.5%)	656 (77.2%)	
Employed	5 (3.1%)		20 (12.3%)	32 (19.6%)	106 (65.0%)	
Student & Employed	11 (4.7%)		11 (4.7%)	34 (14.4%)	180 (76.3%)	<0.001
Others	10 (18.9%)		7 (13.2%)	9 (17.0%)	27 (50.9%)	
Level of education						
Foundation	17 (2.8%)	24 (4.0%)	36 (5.9%)	100 (16.5%)	429 (70.8%)	
Undergraduate	3 (0.7%)	6 (1.4%)	24 (5.8%)	56 (13.4%)	328 (78.7%)	0.003
Postgraduate	0 (0%)	0 (0%)	4 (3.5%)	15 (13.2%)	95 (83.3%)	
Study subject						
Arts	2 (0.7%)	6 (2.1%)	21 (7.4%)	51 (18%)	203 (71.7%)	
Health	2 (1.2%)	6 (3.5%)	9 (5.2%)	16 (9.2%)	140 (80.9%)	
Science	9 (2.0%)	8 (1.8%)	18 (4.0%)	66 (14.7%)	348 (77.5%)	0.078
Others	5 (2.7%)	8 (4.4%)	11 (6.0%)	30 (16.5%)	128 (70.3%)	
Living arrangement						
Living alone (all the time)	3 (2.1%)	2 (1.4%)	7 (4.9%)	17 (11.8%)	115 (79.9%)	
Living alone from Monday -Friday	1 (2.2%)	1 (2.2%)	3 (6.5%)	11 (23.9%)	30 (65.2%)	0.633
Living with others	17 (1.5%)	29 (2.6%)	71 (6.4%)	169 (15.3%)	820 (74.1%)	
Smoking status						
Non-smoker	17 (1.8%)	20 (2.1%)	57 (6.0%)	148 (15.6%)	709 (74.6%)	
Less than or equal to 5 a day	1 (0.7%)	2 (1.3%)	5 (3.4%)	23 (15.4%)	118 (79.2%)	0.092
More than 5 a day	4 (2.0%)	10 (5.0%)	18 (9.0%)	27 (13.6%)	140 (70.4%)	
Alcohol						
Low	15 (1.7%)	17 (2.0%)	54 (6.2%)	132 (15.2%)	649 (74.9%)	
Medium	2 (1.6%)	6 (4.8%)	9 (7.3%)	19 (15.3%)	88 (71.0%)	0.721
High	4 (1.4%)	8 (2.8%)	14 (5.0%)	46 (16.4%)	209 (74.4%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted

Appendix 4.6 Association between physical activity attitudes and demographic/lifestyle factors

a. Difficult/easy

DEMOGRAPHIC AND LIFESTYLE FACTORS	**Attitude towards Physical activity**					
	Difficult	**2**	**3**	**4**	**Easy**	**Significance P-Value†**
Age groups						
18-19 yr olds	59 (12.7%)	82 (17.6%)	122 (26.2%)	90 (19.4%)	112 (24.1%)	
20-22 yr olds	65 (11.1%)	108 (18.4%)	165 (28.1%)	115 (19.6%)	134 (22.8%)	0.158
23+	41 (16.7%)	43 (17.6%)	72 (29.4%)	29 (11.8%)	60 (24.5%)	
Gender						
Male	40 (11.4%)	44 (12.6%)	70 (20.0%)	62 (17.7%)	134 (38.3%)	<0.001
Female	121 (13.2%)	184 (20.0%)	278 (30.3%)	168 (18.3%)	167 (18.2%)	
Employment and study status						
Student	94 (11.1%)	144 (17.0%)	242 (28.5%)	171 (20.2%)	197 (23.2%)	
Employed	25 (15.5%)	33 (20.5%)	39 (24.2%)	12 (7.5%)	52 (32.3%)	0.002
Student & Employed	35 (14.8%)	47 (19.8%)	65 (27.4%)	46 (19.4%)	44 (18.6%)	
Others	11 (21.6%)	9 (17.6%)	13 (25.5%)	5 (9.8%)	13 (25.5%)	
Level of education						
Foundation	85 (14.0%)	107 (17.7%)	170 (28.1%)	111 (18.3%)	132 (21.8%)	0.733
Undergraduate	41 (9.9%)	70 (16.9%)	120 (28.9%)	79 (19.0%)	105 (25.3%)	
Postgraduate	15 (13.3%)	21 (18.6%)	30 (26.5%)	21 (18.6%)	26 (23.0%)	
Study subject						
Arts	35 (12.4%)	50 (17.7%)	91 (32.3%)	49 (17.4%)	57 (20.2%)	
Health	15 (8.7%)	34 (19.7%)	48 (27.7%)	29 (16.8%)	47 (27.2%)	0.377
Science	59 (13.1%)	79 (17.6%)	118 (26.3%)	94 (20.9%)	99 (22.0%)	
Others	24 (13.3%)	27 (15.0%)	50 (27.8%)	28 (15.6%)	51 (28.3%)	
Living arrangement						
Living alone (all the time)	28 (19.7%)	29 (20.4%)	37 (26.1%)	23 (16.2%)	25 (17.6%)	0.026
Living alone from Monday -Friday	5 (11.1%)	5 (11.1%)	20 (44.4%)	4 (8.9%)	11 (24.4%)	
Living with others	131 (11.9%)	199 (18.0%)	301 (27.3%)	205 (18.6%)	267 (24.2%)	
Smoking status						
Non-smoker	112 (11.8%)	176 (18.6%)	257 (27.1%)	183 (19.3%)	219 (23.1%)	
Less than or equal to 5 a day	19 (12.8%)	25 (16.8%)	48 (32.2%)	21 (14.1%)	36 (24.2%)	0.331
More than 5 a day	34 (17.3%)	31 (15.7%)	53 (26.9%)	30(15.2%)	49 (24.9%)	
Alcohol						
Low	112 (13.0%)	154 (17.9%)	237 (27.5%)	147 (17.1%)	212 (24.6%)	
Medium	16 (12.9%)	29 (23.4%)	29 (23.4%)	25 (20.2%)	25 (20.2%)	0.549
High	33 (11.7%)	45 (16.0%)	82 (29.2%)	58 (20.6%)	63 (22.4%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted

b. Relaxing/stressful

DEMOGRAPHIC AND LIFESTYLE FACTORS	**Attitude towards physical activity**					
	Relaxing	**2**	**3**	**4**	**Stressful**	**Significance P-Value†**
Age groups						
18-19 yr olds	109 (23.6%)	100 (21.7%)	154 (33.4%)	64 (13.9%)	34 (7.4%)	0.022
20-22 yr olds	104 (17.7%)	169 (28.8%)	219 (37.4%)	70 (11.9%)	24 (4.1%)	
23+	48 (19.5%)	59 (24.0%)	92 (37.4%)	29 (11.8%)	18 (7.3%)	
Gender						
Male	97 (27.7%)	96 (27.4%)	99 (28.3%)	39 (11.1%)	19 (5.4%)	<0.001
Female	159 (17.4%)	224 (24.5%)	359 (39.3%)	119 (13.0%)	53 (5.8%)	
Employment and study status						
Student	185 (21.7%)	224 (26.3%)	297 (34.9%)	103 (12.1%)	42 (4.9%)	
Employed	26 (16.5%)	32 (20.3%)	65 (41.1%)	23 (14.6%)	12 (7.6%)	0.373*
Student & Employed	39 (16.7%)	62 (26.6%)	83 (35.6%)	31 (13.3%)	18 (7.7%)	
Others	11 (22.0%)	9 (18.0%)	20 (40.0%)	6 (12.0%)	4 (8.0%)	
Level of education						
Foundation	130 (21.7%)	139 (23.2%)	211 (35.2%)	76 (12.7%)	44 (7.3%)	0.009
Undergraduate	75 (18.0%)	129 (30.9%)	152 (36.5%)	50 (12.0%)	11 (2.6%)	
Postgraduate	24 (20.7%)	30 (25.9%)	39 (33.6%)	12 (10.3%)	11 (9.5%)	
Study subject						
Arts	51 (18.0%)	68 (24.0%)	98 (34.6%)	50 (17.7%)	16 (5.7%)	
Health	37 (21.3%)	56 (32.2%)	60 (34.5%)	12 (6.9%)	9 (5.2%)	
Science	90 (20.0%)	120 (26.7%)	161 (35.9%)	50 (11.1%)	28 (6.2%)	0.111
Others	42 (23.5%)	48 (26.8%)	64 (35.8%)	16 (8.9%)	9 (5.0%)	
Living arrangement						
Living alone (all the time)	25 (17.5%)	34 (23.8%)	47 (32.9%)	18 (12.6%)	19 (13.3%)	0.001
Living alone from Monday -Friday	8 (17.8%)	12 (26.7%)	10 (22.2%)	10 (22.2%)	5 (11.1%)	
Living with others	225 (20.5%)	281 (25.6%)	406 (37.0%)	134 (12.2%)	52 (4.7%)	
Smoking status						
Non-smoker	211 (22.3%)	248 (26.2%)	324 (34.2%)	116 (12.2%)	48 (5.1%)	
Less than or equal to 5 a day	28 (18.8%)	32 (21.5%)	66 (44.3%)	17 (11.4%)	6 (4.0%)	<0.001
More than 5 a day	20 (10.4%)	48 (24.9%)	73 (37.8%)	30 (15.5%)	22 (11.4%)	
Alcohol						
Low	180 (21.0%)	214 (25.0%)	309 (36.1%)	106 (12.4%)	47 (5.5%)	
Medium	21 (17.1%)	29 (23.6%)	46 (37.4%)	19 (15.4%)	8 (6.5%)	0.950
High	55 (19.4%)	76 (26.8%)	103 (36.3%)	33 (11.6%)	17 (6.0%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted

c. Not enjoyable/enjoyable

DEMOGRAPHIC AND LIFESTYLE FACTORS	**Attitude towards Physical activity**					
	Not enjoyable	**2**	**3**	**4**	**Enjoyable**	**Significance P-Value†**
Age groups						
18-19 yr olds	25 (5.4%)	49 (10.6%)	125 (27.0%)	116 (25.1%)	148 (32.0%)	
20-22 yr olds	23 (3.9%)	61 (10.4%)	144 (24.6%)	178 (30.4%)	179 (30.6%)	0.034
23+	8 (3.3%)	25 (10.2%)	89 (36.3%)	56 (22.9%)	67 (27.3%)	
Gender						
Male	16 (4.5%)	27 (7.7%)	75 (21.3%)	98 (27.8%)	136 (38.6%)	<0.001
Female	39 (4.3%)	106 (11.6%)	277 (30.3%)	240(26.3%)	251 (27.5%)	
Employment and study status						
Student	28 (3.3%)	94 (11.1%)	209 (24.6%)	244 (28.7%)	274 (32.3%)	
Employed	9 (5.7%)	16 (10.1%)	54 (34.0%)	37 (23.3%)	43 (27.0%)	0.006
Student & Employed	13 (5.6%)	17 (7.3%)	79 (33.9%)	60 (25.8%)	64 (27.5%)	
Others	6 (11.8%)	8 (15.7%)	15 (29.4%)	9 (17.6%)	13 (25.5%)	
Level of education						
Foundation	27 (4.5%)	69 (11.5%)	172 (28.7%)	142 (23.7%)	190 (31.7%)	0.033
Undergraduate	16 (3.8%)	34 (8.2%)	101 (24.2%)	139 (33.3%)	127 (30.5%)	
Postgraduate	4 (3.5%)	14 (12.3%)	37 (32.5%)	24 (21.1%)	35 (30.7%)	
Study subject						
Arts	12 (4.3%)	38 (13.5%)	83 (29.4%)	75 (26.6%)	74 (26.2%)	
Health	6 (3.5%)	19 (11.0%)	47 (27.3%)	45 (26.2%)	55 (32.0%)	0.456
Science	18 (4.0%)	41 (9.2%)	124 (27.7%)	124 (27.7%)	140 (31.3%)	
Others	5 (2.7%)	19 (10.4%)	38 (20.8%)	53 (29.0%)	68 (37.2%)	
Living arrangement						
Living alone (all the time)	12 (8.3%)	17 (11.8%)	41 (28.5%)	41 (28.5%)	33 (22.9%)	0.082
Living alone from Monday -Friday	3 (6.7%)	5 (11.1%)	16 (35.6%)	7 (15.6%)	14 (31.1%)	
Living with others	40 (3.6%)	112 (10.2%)	299 (27.3%)	301 (27.4%)	345 (31.4%)	
Smoking status						
Non-smoker	37 (3.9%)	93 (9.8%)	249 (26.2%)	262 (27.6%)	308 (32.5%)	
Less than or equal to 5 a day	3 (2.1%)	15 (10.3%)	50 (34.2%)	35 (24.0%)	43 (29.5%)	0.004
More than 5 a day	16 (8.2%)	27 (13.9%)	58 (29.9%)	52 (26.8%)	41 (21.1%)	
Alcohol						
Low	35 (4.1%)	85 (9.9%)	238 (27.7%)	222 (25.8%)	280 (32.6%)	
Medium	4 (3.3%)	18 (14.8%)	36 (29.5%)	33 (27.0%)	31 (25.4%)	
High	16 (5.7%)	30 (10.6%)	77 (27.3%)	83 (29.4%)	76 (27.0%)	0.377

† All P values were based on Pearson Chi-square test unless otherwise highlighted

d. Unhealthy/healthy

DEMOGRAPHIC AND LIFESTYLE FACTORS	**Attitude towards physical activity**					
	Unhealthy	**2**	**3**	**4**	**Healthy**	**Significance P-Value†**
Age groups						
18-19 yr olds	5 (1.1%)	9 (1.9%)	40 (8.6%)	99 (21.4%)	310 (67.0%)	
20-22 yr olds	4 (0.7%)	8 (1.4%)	47 (8.0%)	136 (23.2%)	391 (66.7%)	0.945
23+	2 (0.8%)	4 (1.6%)	24 (9.8%)	48 (19.6%)	167 (68.2%)	
Gender						
Male	5(1.4%)	5 (1.4%)	35 (10.1%)	73 (21.0%)	230 (66.1%)	0.428
Female	5 (0.5%)	14 (1.5%)	75 (8.2%)	205 (22.4%)	617 (67.4%)	
Employment and study status						
Student	5 (0.6%)	13 (1.5%)	66 (7.8%)	177 (20.8%)	590 (69.3%)	
Employed	1 (0.6%)	1 (0.6%)	19 (11.9%)	38 (23.9%)	100 (62.9%)	0.125
Student & Employed	3 (1.3%)	5 (2.1%)	20 (8.5%)	58 (24.7%)	149 (63.4%)	
Others	2 (4.1%)	2 (4.1%)	6 (12.2%)	10 (20.4%)	29 (59.2%)	
Level of education						
Foundation	6 (1.0%)	12 (2.0%)	60 (10.0%)	127 (21.1%)	396 (65.9%)	0.411
Undergraduate	3 (0.7%)	5 (1.2%)	29 (7.0%)	94 (22.6%)	285 (68.5%)	
Postgraduate	0 (0%)	3 (2.6%)	6 (5.2%)	22 (19.1%)	84 (73.0%)	
Study subject						
Arts	3 (1.1%)		27 (9.6%)	69 (24.6%)	182 (64.8%)	
Health	6 (3.5%)		22 (12.7%)	24 (13.9%)	121 (69.9%)	0.030
Science	12 (2.7%)		27 (6.0%)	100 (22.3%)	310 (69.0%)	
Others	7 (3.8%)		17 (9.3%)	36 (19.8%)	122 (67.0%)	
Living arrangement						
Living alone (all the time)	4 (2.8%)		15 (10.4%)	33 (22.9%)	92 (63.9%)	0.151#
Living alone from Monday -Friday	3 (6.8%)		5 (11.4%)	14 (31.8%)	22 (50.0%)	
Living with others	24 (2.2%)		91 (8.3%)	235 (21.4%)	749 (68.2%)	
Smoking status						
Non-smoker	18 (1.9%)		76 (8.0%)	205 (21.6%)	648 (68.4%)	
Less than or equal to 5 a day	4 (2.7%)		10 (6.8%)	25 (16.9%)	109 (73.6%)	0.002
More than 5 a day	10 (5.1%)		25 (12.8%)	52 (26.7%)	108 (55.4%)	
Alcohol						
Low	6 (0.7%)	15 (1.7%)	83 (9.7%)	174 (20.3%)	580 (67.6%)	
Medium	0 (0%)	1 (0.8%)	8 (6.5%)	30 (24.2%)	85 (68.5%)	0.222
High	4 (1.4%)	3 (1.1%)	19 (6.8%)	74 (26.3%)	181 (64.4%)	

† All P values were based on Pearson Chi-square test unless otherwise highlighted
# >20% of the cells had a expected count less than 5 in spite of the grouping

Appendix 4.7 Association between physical activity (PA) attitudes and PA intention

PA attitude	PA intention					
	No intention	**2**	**3**	**4**	**Strong intention**	**Significance P value†**
Difficult	18 (10.9%)	16 (9.7%)	20 (12.1%)	25 (15.2%)	86 (52.1%)	
2	9 (3.9%)	24 (10.3%)	33 (14.2%)	51 (21.9%)	116 (49.8%)	
3	2 (0.6%)	14 (3.9%)	70 (19.6%)	85 (23.7%)	187 (52.2%)	<0.001
4	0 (0%)	0 (0%)	14 (6.1%)	38 (16.5%)	179 (77.5%)	
Easy	1 (0.3%)	1 (0.3%)	11 (3.6%)	26 (8.6%)	265 (87.2%)	
Relaxing	1 (0.4%)	3 (1.2%)	8 (3.1%)	16 (6.2%)	232 (89.2%)	
2	6 (1.8%)	13 (4.0%)	20 (6.1%)	54 (16.5%)	234 (71.6%)	
3	8 (1.7%)	20 (4.3%)	76 (16.4%)	112(24.2%)	247 (53.3%)	
4	7 (4.3%)	10 (6.1%)	29 (17.8%)	38 (23.3%)	79 (48.5%)	<0.001
Stressful	6 (7.9%)	8 (10.5%)	13 (17.1%)	6 (7.9%)	43 (56.6%)	
Not enjoyable	10 (17.9%)	8 (14.3%)	13 (23.2%)	7 (12.5%)	18 (32.1%)	
2	6 (4.4%)	17 (12.6%)	26 (19.3%)	32 (23.7%)	54 (40.0%)	
3	10 (2.8%)	17 (4.8%)	71 (19.9%)	86 (24.1%)	173 (48.5%)	<0.001
4	0 (0%)	8 (2.3%)	27 (7.8%)	81 (23.3%)	232 (66.7%)	
Enjoyable	3 (0.8%)	3 (0.8%)	10 (2.5%)	19 (4.8%)	358 (91.1%)	
Unhealthy and 2	14 (43.8%)		5 (15.6%)	3 (9.4%)	10 (31.3%)	
3	15 (13.6%)		45 (40.9%)	23 (20.9%)	27 (24.5%)	
4	15 (5.3%)		52 (18.4%)	111(39.4%)	104(36.9%)	<0.001
Healthy	36 (4.2%)		45 (5.2%)	89 (10.3%)	696 (80.4%)	

† Pearson Chi-squared test

Appendix 4.8 Association between physical activity subjective norm and demographic/ lifestyle factors

	SUBJECTIVE NORM			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Important**	**Mixed**	**Not important**	**Significance P value†**
Age groups				
18-19 yr olds	94 (20.6%)	93 (20.4%)	269 (59.0%)	
20-22 yr olds	81 (13.9%)	117 (20.0%)	386 (66.1%)	0.001
23+	25 (10.4%)	41 (17.1%)	174 (72.5%)	
Gender				
Male	70 (20.1%)	94 (26.9%)	185 (53.0%)	<0.001
Female	126 (14.0%)	148 (16.4%)	629 (69.7%)	
Employment and study status				
Student	126 (15.0%)	158 (18.8%)	555 (66.2%)	0.221
Employed	19 (11.9%)	36 (22.5%)	105 (65.6%)	
Student & Employed	47 (20.6%)	44 (19.3%)	137 (60.1%)	
Others	8 (15.4%)	13 (25.0%)	31 (59.6%)	
Level of education				
Foundation	113 (19.0%)	120 (20.1%)	363 (60.9%)	
Undergraduate	52 (12.7%)	74 (18.1%)	282 (69.1%)	0.036
Postgraduate	14 (12.6%)	20 (18.0%)	77 (69.4%)	
Study subject				
Arts	32 (11.6%)	46 (16.7%)	198 (71.7%)	
Health	36 (21.3%)	33 (19.5%)	100 (59.2%)	
Science	70 (15.8%)	83 (18.7%)	291 (65.5%)	0.014
Others	31 (17.3%)	46 (25.7%)	102 (57.0%)	
Living arrangement				
Living alone (all the time)	22 (15.7%)	27 (19.3%)	91 (65.0%)	
Living alone from Monday -Friday	6 (13.3%)	8 (17.8%)	31 (68.9%)	0.985
Living with others	171 (15.7%)	214 (19.7%)	703 (64.6%)	
Smoking status				
Non-smoker	130 (13.9%)	186 (19.9%)	619 (66.2%)	
Less than or equal to 5 a day	30 (20.4%)	31 (21.1%)	86 (58.5%)	0.056
More than 5 a day	40 (20.6%)	33 (17.0%)	121 (62.4%)	
Alcohol				
Low	125 (14.7%)	166 (19.5%)	559 (65.8%)	
Medium	21 (17.5%)	20 (16.7%)	79 (65.8%)	0.647
High	50 (17.8%)	56 (19.9%)	175 (62.3%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

Appendix 4.9 Association between physical activity (PA) subjective norm and PA intention

PA Subjective Norm	**PA intention**					
	No intention	**2**	**3**	**4**	**Strong intention**	**Significance P value†**
To impress	5 (2.5%)	8 (4.0%)	18 (9.1%)	25 (12.6%)	142 (71.7%)	
Mixed	5 (2.0%)	12 (4.8%)	30 (12.0%)	39 (15.6%)	164 (65.6%)	
Not to impress	20 (2.4%)	35 (4.3%)	96 (11.7%)	156(19.0%)	516 (62.7%)	0.465

† Pearson Chi-squared test

Appendix 4.10 Association between PA perceived behavioural control (PBC) and demographic/ lifestyle factors

DEMOGRAPHIC AND LIFESTYLE FACTORS	**PA - PBC to do adequate exercise**					
	No confidence	**2**	**3**	**4**	**High confidence**	**Sig P-Value†**
Age groups						
18-19 yr olds	41 (8.8%)	54 (11.6%)	85 (18.3%)	105 (22.6%)	179 (38.6%)	
20-22 yr olds	52 (8.8%)	68 (11.5%)	117 (19.9%)	168 (28.5%)	184 (31.2%)	0.279
23+	26 (10.5%)	30 (12.1%)	52 (21.1%)	63 (25.5%)	76 (30.8%)	
Gender						
Male	24 (6.9%)	26 (7.4%)	53 (15.1%)	84 (24.0%)	163 (46.6%)	<0.001
Female	92 (10.0%)	124 (13.5%)	192 (20.9%)	243 (26.4%)	269 (29.2%)	
Employment and study status						
Student	76 (8.9%)	111 (13.1%)	186 (21.9%)	226 (26.6%)	251 (29.5%)	
Employed	2 (1.2%)	11 (6.7%)	12 (7.4%)	41 (25.2%)	97 (59.5%)	<0.001
Student & Employed	37 (15.7%)	27 (11.4%)	48 (20.3%)	58 (24.6%)	66 (28.0%)	
Others	4 (7.8%)	3 (5.9%)	8 (15.7%)	11 (21.6%)	25 (49.0)	
Level of education						
Foundation	62 (10.3%)	74 (12.3%)	136 (22.6%)	143 (23.7%)	188 (31.2%)	0.732
Undergraduate	43 (10.3%)	51 (12.2%)	82 (19.7%)	119 (28.5%)	122 (29.3%)	
Postgraduate	13 (11.3%)	17 (14.8%)	24 (20.9%)	32 (27.8%)	29 (25.2%)	
Study subject						
Arts	38 (13.5%)	34 (12.1%)	70 (24.8%)	60 (21.3%)	80 (28.4%)	
Health	15 (8.6%)	14 (8.0%)	38 (21.8%)	45 (25.9%)	62 (35.6%)	
Science	44 (9.9%)	68 (15.2%)	88 (19.7%)	132 (29.6%)	114 (25.6%)	0.012
Others	13 (7.1%)	21 (11.5%)	35 (19.1%)	47 (25.7%)	67 (36.6%)	
Living arrangement						
Living alone (all the time)	17 (11.9%)	22 (15.4%)	23 (16.1%)	35 (24.5%)	46 (32.2%)	0.053
Living alone from Monday -Friday	3 (6.7%)	1 (2.2%)	10 (22.2%)	20 (44.4%)	11 (24.4%)	
Living with others	99 (9.0%)	129 (11.7%)	221 (20.0%)	279 (25.2%)	377 (34.1%)	
Smoking status						
Non-smoker	85 (8.9%)	106 (11.2%)	189 (19.9%)	245 (25.8%)	325 (34.2%)	
Less than or equal to 5 a day	12 (8.2%)	18 (12.2%)	27 (18.4%)	38 (25.9%)	52 (35.4%)	0.906
More than 5 a day	22 (11.1%)	28 (14.1%)	37 (18.6%)	52 (26.1%)	60 (30.2%)	
Alcohol						
Low	78 (9.0%)	96 (11.1%)	166 (19.2%)	212 (24.6%)	311 (36.0%)	0.331
Medium	13 (10.4%)	20 (16.0%)	28 (22.4%)	32 (25.6%)	32 (25.6%)	
High	25 (8.9%)	34 (12.1%)	51 (18.1%)	82 (29.2%)	89 (31.7%)	

† All P values were based on Pearson Chi-square test

Appendix 4.11 Association between physical activity (PA) perceived behavioural control and PA intention

PA Perceived Behavioural Control	PA intention					
	No intention	**2**	**3**	**4**	**Strong intention**	**Significance P value†**
No confidence	6 (5.0%)	4 (3.4%)	15 (12.6%)	20 (16.8%)	74 (62.2%)	
2	1 (0.7%)	8 (5.3%)	21 (13.8%)	46 (30.3%)	76 (50.0%)	
3	0 (0%)	5 (2.0%)	42 (16.7%)	53 (21.0%)	152 (60.3%)	<0.001
4	6 (1.8%)	17 (5.1%)	25 (7.5%)	65 (19.5%)	221 (66.2%)	
High confidence	17 (3.9%)	20 (4.6%)	46 (10.5%)	42 (9.6%)	313 (71.5%)	

† Pearson Chi-squared test

Appendix 4.12 Association between physical activity intention and demographic/lifestyle factors

DEMOGRAPHIC AND LIFESTYLE FACTORS	**Physical activity intention**					
	No intention	**2**	**3**	**4**	**Strong intention**	**Sig P-Value†**
Age groups						
18-19 yr olds	9 (1.9%)	20 (4.3%)	58 (12.4%)	85 (18.2%)	295 (63.2%)	
20-22 yr olds	15 (2.5%)	28 (4.8%)	60 (10.2%)	96 (16.3%)	390 (66.2%)	0.788
23+	6 (2.4%)	7 (2.8%)	31 (12.6%)	46 (18.7%)	156 (63.4%)	
Gender						
Male	7 (2.0%)	9 (2.6%)	39 (11.1%)	57 (16.2%)	240 (68.2%)	0.284
Female	22 (2.4%)	44 (4.8%)	109 (11.8%)	167 (18.2%)	578 (62.8%)	
Employment and study status						
Student	5 (0.6%)	24 (2.8%)	73 (8.6%)	148 (17.4%)	600 (70.6%)	<0.001
Employed	14 (8.6%)	24 (14.7%)	37 (22.7%)	27 (16.6%)	61 (37.4%)	
Student & Employed	4 (1.7%)	7 (3.0%)	25 (10.5%)	41 (17.3%)	160 (67.5%)	
Others	7 (13.7%)	0 (0%)	14 (27.5%)	11 (21.6%)	19 (37.3%)	
Level of education						
Foundation	13 (2.1%)	19 (3.1%)	66 (10.9%)	102 (16.9%)	405 (66.9%)	0.099
Undergraduate	1 (0.2%)	9 (2.2%)	36 (8.6%)	77 (18.5%)	294 (70.5%)	
Postgraduate	0 (0%)	3 (2.6%)	8 (7.0%)	19 (16.5%)	85 (73.9%)	
Study subject						
Arts	14 (5.0%)		29 (10.3%)	54 (19.2%)	184 (65.5%)	
Health	11 (6.4%)		13 (7.5%)	29 (16.8%)	120 (69.4%)	
Science	9 (2.0%)		37 (8.2%)	68 (15.0%)	338 (74.8%)	0.029
Others	8 (4.4%)		24 (13.2%)	36 (19.8%)	114 (62.6%)	
Living arrangement						
Living alone (all the time)	8 (5.6%)	9 (6.3%)	17 (11.8%)	21 (14.6%)	89 (61.8%)	
Living alone from Monday -Friday	0 (0%)	3 (6.8%)	5 (11.4%)	10 (22.7%)	26 (59.1%)	0.116
Living with others	21 (1.9%)	43 (3.9%)	126 (11.4%)	196 (17.7%)	721 (65.1%)	
Smoking status						
Non-smoker	15 (1.6%)	38 (4.0%)	106 (11.1%)	171 (18.0%)	622 (65.3%)	
Less than or equal to 5 a day	4 (2.7%)	7 (4.7%)	11 (7.4%)	20 (13.5%)	106 (71.6%)	0.004
More than 5 a day	11 (5.6%)	10 (5.1%)	31 (15.7%)	36 (18.2%)	110 (55.6%)	
Alcohol						
Low	22 (2.5%)	41 (4.8%)	113 (13.1%)	130 (15.1%)	557 (64.5%)	
Medium	2 (1.6%)	6 (4.8%)	16 (12.8%)	30 (24.0%)	71 (56.8%)	0.003
High	5 (1.8%)	6 (2.1%)	19 (6.7%)	64 (22.6%)	189 (66.8%)	

† All P values were based on Pearson Chi-square test

Appendix 5.1 Association between diet facilitators and demographic/ lifestyle factors

a. Health

	DIET - HEALTH		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Very encouraging**	**Not very encouraging**	**Significance P value†**
Age groups			
18-19 yr olds	257 (63.8%)	146 (36.2%)	
20-22 yr olds	358 (67.7%)	171 (32.3%)	0.301
23+	155 (69.2%)	69 (30.8%)	
Gender			
Male	191 (61.8%)	118 (38.2%)	0.040‡
Female	563 (68.4%)	260 (31.6%)	
Employment and study status			
Student	500 (66.2%)	255 (33.8%)	
Employed	105 (71.4%)	42 (28.6%)	0.447
Student & Employed	133 (63.9%)	75 (36.1%)	
Others	32 (71.1%)	13 (28.9%)	
Level of education			
Foundation	326 (62.9%)	192 (37.1%)	
Undergraduate	267 (68.3%)	124 (31.7%)	0.173
Postgraduate	68 (69.4%)	30 (30.6%)	
Study subject			
Arts	153 (62.2%)	93 (37.8%)	
Health	115 (72.8%)	43 (27.2%)	
Science	265 (66.8%)	132 (33.2%)	0.167
Others	106 (64.6%)	58 (35.4%)	
Living arrangement			
Living alone (all the time)	82 (66.1%)	42 (33.9%)	
Living alone from Monday - Friday	31 (70.5%)	13 (29.5%)	0.855
Living with others	654 (66.5%)	330 (33.5%)	
Smoking status			
Non-smoker	581 (68.8%)	264 (31.2%)	
Less than or equal to 5 a day	90 (65.7%)	47 (34.3%)	0.011
More than 5 a day	98 (57.0%)	74 (43.0%)	
Alcohol			
Low	531 (68.5%)	244 (31.5%)	
Medium	68 (63.6%)	39 (36.4%)	0.146
High	155 (62.2%)	94 (37.8%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

b. Appearance

	DIET - APPEARANCE		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Very encouraging**	**Not very encouraging**	**Significance P value†**
Age groups			
18-19 yr olds	268 (67.5%)	129 (32.5%)	
20-22 yr olds	340 (67.9%)	161 (32.1%)	0.519
23+	150 (71.8%)	59 (28.2%)	
Gender			
Male	133 (52.6%)	120 (47.4%)	
Female	608 (73.3%)	222 (26.7%)	<0.001‡
Employment and study status			
Student	496 (68.7%)	226 (31.3%)	
Employed	105 (73.9%)	37 (26.1%)	0.086
Student & Employed	134 (67.3%)	65 (32.7%)	
Others	23 (53.5%)	20 (46.5%)	
Level of education			
Foundation	332 (64.8%)	180 (35.2%)	
Undergraduate	256 (72.5%)	97 (27.5%)	0.043
Postgraduate	58 (63.7%)	33 (36.3%)	
Study subject			
Arts	167 (68.4%)	77 (31.6%)	
Health	109 (74.1%)	38 (25.9%)	
Science	254 (68.5%)	117 (31.5%)	0.107
Others	92 (60.9%)	59 (39.1%)	
Living arrangement			
Living alone (all the time)	81 (69.2%)	36 (30.8%)	
Living alone from Monday - Friday	26 (72.2%)	10 (27.8%)	0.875
Living with others	648 (68.4%)	300 (31.6%)	
Smoking status			
Non-smoker	565 (69.2%)	252 (30.8%)	
Less than or equal to 5 a day	93 (72.7%)	35 (27.3%)	
More than 5 a day	99 (62.7%)	59 (37.3%)	0.158
Alcohol			
Low	521 (70.5%)	218 (29.5%)	
Medium	69 (63.9%)	39 (36.1%)	0.097
High	151 (64.0%)	85 (36.0%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

c. Subjective norm

	DIET -SUBJECTIVE NORM		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Very encouraging**	**Not very encouraging**	**Significance P value†**
Age groups			
18-19 yr olds	33 (36.3%)	58 (63.7%)	
20-22 yr olds	43 (44.3%)	54 (55.7%)	0.257
23+	18 (51.4%)	17 (48.6%)	
Gender			
Male	25 (40.3%)	37 (59.7%)	0.880‡
Female	66 (42.0%)	91 (58.0%)	
Employment and study status			
Student	64 (43.5%)	83 (56.5%)	
Employed	10 (31.3%)	22 (68.8%)	0.579
Student & Employed	15 (46.9%)	17 (53.1%)	
Others	5 (41.7%)	7 (58.3%)	
Level of education			
Foundation	41 (37.3%)	69 (62.7%)	
Undergraduate	36 (51.4%)	34 (48.6%)	0.029
Postgraduate	1 (11.1%)	8 (88.9%)	
Study subject			
Arts	17 (34.0%)	33 (66.0%)	
Health	25 (54.3%)	21 (45.7%)	0.080
Science	19 (31.1%)	42 (68.9%)	
Others	9 (42.9%)	12 (57.1%)	
Living arrangement			
Living alone (all the time)	8 (50.0%)	8 (50.0%)	
Living alone from Monday - Friday	5 (41.7%)	7 (58.3%)	0.804
Living with others	81 (41.5%)	114 (58.5%)	
Smoking status			
Non-smoker	70 (42.2%)	96 (57.8%)	
Less than or equal to 5 a day	9 (39.1%)	14 (60.9%)	0.932
More than 5 a day	15 (44.1%)	19 (55.9%)	
Alcohol			
Low	61 (42.4%)	83 (57.6%)	
Medium	13 (50.0%)	13 (50.0%)	0.416
High	17 (34.7%)	32 (65.3%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

d. Diet choices

	DIET CHOICES			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Very helpful**	**Mixed**	**Not very helpful**	**Significance P value†**
Age groups				
18-19 yr olds	331 (72.6%)	77 (16.9%)	48 (10.5%)	
20-22 yr olds	399 (68.8%)	124 (21.4%)	57 (9.8%)	0.108
23+	165 (67.9%)	60 (24.7%)	18 (7.4%)	
Gender				
Male	208 (60.8%)	73 (21.3%)	61 (17.8%)	<0.001
Female	672 (74.0%)	180 (19.8%)	56 (6.2%)	
Employment and study status				
Student	583 (69.5%)	172 (20.5%)	84 (10.0%)	
Employed	114 (71.3%)	35 (21.9%)	11 (6.9%)	0.371
Student & Employed	165 (72.1%)	45 (19.7%)	19 (8.3%)	
Others	33 (66.0%)	8 (16.0%)	9 (18.0%)	
Level of education				
Foundation	428 (71.8%)	94 (15.8%)	74 (12.4%)	
Undergraduate	274 (67.2%)	103 (25.2%)	31 (7.6%)	0.001
Postgraduate	75 (66.4%)	29 (25.7%)	9 (8.0%)	
Study subject				
Arts	187 (68.0%)	58 (21.1%)	30 (10.9%)	
Health	131 (76.6%)	30 (17.5%)	10 (5.8%)	0.243
Science	302 (67.7%)	97 (21.7%)	47 (10.5%)	
Others	124 (70.5%)	30 (17.0%)	22 (12.5%)	
Living arrangement				
Living alone (all the time)	105 (74.5%)	25 (17.7%)	11 (7.8%)	
Living alone from Monday -Friday	30 (65.2%)	10 (21.7%)	6 (13.0%)	0.712
Living with others	758 (69.9%)	223 (20.6%)	104 (9.6%)	
Smoking status				
Non-smoker	662 (70.4%)	197 (20.9%)	82 (8.7%)	
Less than or equal to 5 a day	97 (67.4%)	33 (22.9%)	14 (9.7%)	0.125
More than 5 a day	133 (69.6%)	31 (16.2%)	27 (14.1%)	
Alcohol				
Low	613 (72.3%)	160 (18.9%)	75 (8.8%)	
Medium	86 (69.4%)	28 (22.6%)	10 (8.1%)	0.197
High	180 (65.0%)	65 (23.5%)	32 (11.6%)	

† Pearson Chi-squared test

e. Information on diet

	INFORMATION ON DIET		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Very helpful**	**Not very helpful**	**Significance P value†**
Age groups			
18-19 yr olds	317 (68.9%)	143 (31.1%)	
20-22 yr olds	419 (71.7%)	165 (28.3%)	0.461
23+	180 (72.9%)	67 (27.1%)	
Gender			
Male	212 (61.1%)	135 (38.9%)	<0.001‡
Female	684 (74.7%)	232 (25.3%)	
Employment and study status			
Student	585 (69.2%)	260 (30.8%)	
Employed	124 (76.1%)	39 (23.9%)	0.249
Student & Employed	169 (73.5%)	61 (26.5%)	
Others	38 (73.1%)	14 (26.9%)	
Level of education			
Foundation	424 (70.7%)	176 (29.3%)	
Undergraduate	287 (69.7%)	125 (30.3%)	0.705
Postgraduate	84 (73.7%)	30 (26.3%)	
Study subject			
Arts	193 (69.7%)	84 (30.3%)	
Health	122 (71.3%)	49 (28.7%)	
Science	312 (69.5%)	137 (30.5%)	0.862
Others	130 (72.6%)	49 (27.4%)	
Living arrangement			
Living alone (all the time)	96 (67.6%)	46 (32.4%)	
Living alone from Monday -Fri day	28 (60.9%)	18 (39.1%)	0.172
Living with others	788 (71.9%)	308 (28.1%)	
Smoking status			
Non-smoker	678 (71.7%)	267 (28.3%)	
Less than or equal to 5 a day	99 (67.8%)	47 (32.2%)	0.579
More than 5 a day	137 (69.9%)	59 (30.1%)	
Alcohol			
Low	618 (71.9%)	241 (28.1%)	
Medium	90 (72.6%)	34 (27.4%)	0.265
High	187 (67.0%)	92 (33.0%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

f. Diet opportunities

	DIET OPPORTUNITIES			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Very helpful**	**Mixed**	**Not very helpful**	**Significance P value†**
Age groups				
18-19 yr olds	342 (74.2%)	71 (15.4%)	48 (10.4%)	
20-22 yr olds	406 (70.0%)	103 (17.8%)	71 (12.2%)	0.236
23+	161 (66.0%)	48 (19.7%)	35 (14.3%)	
Gender				
Male	218 (63.0%)	70 (20.2%)	58 (16.8%)	<0.001
Female	673 (73.9%)	146 (16.0%)	92 (10.1%)	
Employment and study status				
Student	572 (68.0%)	163 (19.4%)	106 (12.6%)	0.114
Employed	121 (75.6%)	22 (13.8%)	17 (10.6%)	
Student & Employed	178 (76.7%)	29 (12.5%)	25 (10.8%)	
Others	38 (74.5%)	7 (13.7%)	6 (11.8%)	
Level of education				
Foundation	435 (72.9%)	95 (15.9%)	67 (11.2%)	
Undergraduate	275 (66.7%)	79 (19.2%)	58 (14.1%)	0.160
Postgraduate	74 (64.9%)	26 (22.8%)	14 (12.3%)	
Study subject				
Arts	195 (70.7%)	52 (18.8%)	29 (10.5%)	
Health	125 (72.7%)	30 (17.4%)	17 (9.9%)	0.625
Science	302 (67.4%)	84 (18.8%)	62 (13.8%)	
Others	128 (71.5%)	27 (15.1%)	24 (13.4%)	
Living arrangement				
Living alone (all the time)	93 (66.0%)	26 (18.4%)	22 (15.6%)	
Living alone from Monday -Friday	31 (67.4%)	9 (19.6%)	6 (13.0%)	0.590
Living with others	780 (71.5%)	187 (17.1%)	124 (11.4%)	
Smoking status				
Non-smoker	670 (71.1%)	165 (17.5%)	107 (11.4%)	
Less than or equal to 5 a day	98 (67.6%)	26 (17.9%)	21 (14.5%)	0.762
More than 5 a day	138 (70.8%)	31 (15.9%)	26 (13.3%)	
Alcohol				
Low	618 (72.4%)	142 (16.6%)	94 (11.0%)	
Medium	90 (72.6%)	21 (16.9%)	13 (10.5%)	0.204
High	182 (65.5%)	53 (19.1%)	43 (15.5%)	

† Pearson Chi-squared test

g. Support

	DIET - *SUPPORT*		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Very helpful**	**Not very helpful**	**Significance P value†**
Age groups			
18-19 yr olds	254 (55.6%)	203 (44.4%)	
20-22 yr olds	321 (55.2%)	108 (44.8%)	0.993
23+	133 (55.2%)	571 (44.6%)	
Gender			
Male	164 (48.0%)	178 (52.0%)	0.001
Female	528 (58.1%)	380 (41.9%)	
Employment and study status			
Student	455 (54.4%)	382 (45.6%)	
Employed	94 (58.4%)	67 (41.6%)	0.758
Student & Employed	131 (57.0%)	99 (43.0%)	
Others	28 (56.0%)	22 (44.0%)	
Level of education			
Foundation	340 (57.0%)	256 (43.0%)	
Undergraduate	217 (53.2%)	191 (46.8%)	0.387
Postgraduate	59 (52.2%)	54 (47.8%)	
Study subject			
Arts	151 (55.1%)	123 (44.9%)	
Health	95 (55.6%)	76 (44.4%)	0.967
Science	246 (55.0%)	201 (45.0%)	
Others	94 (53.1%)	83 (46.9%)	
Living arrangement			
Living alone (all the time)	70 (49.6%)	71 (50.4%)	
Living alone from Monday -Fri day	27 (58.7%)	19 (41.3%)	0.321
Living with others	608 (56.0%)	477 (44.0%)	
Smoking status			
Non-smoker	527 (56.3%)	409 (43.7%)	
Less than or equal to 5 a day	76 (52.4%)	69 (47.6%)	0.557
More than 5 a day	104 (53.3%)	91 (46.7%)	
Alcohol			
Low	480 (56.7%)	367 (43.3%)	
Medium	78 (62.9%)	46 (37.1%)	0.007
High	133 (47.8%)	145 (52.2%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

Appendix 5.2 Association between diet barriers and demographic/lifestyle factors

a. Cooking

	DIET – BARRIERS TO COOKING			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Mixed**	**Not a barrier**	**Significance P value†**
Age groups				
18-19 yr olds	66 (14.4%)	129 (28.2%)	262 (57.3%)	
20-22 yr olds	66 (11.5%)	126 (22.0%)	382 (66.6%)	0.035
23+	36 (15.2%)	60 (25.3%)	141 (59.5%)	
Gender				
Male	52 (15.1%)	87 (25.2%)	206 (59.7%)	0.382
Female	110 (12.3%)	220 (24.6%)	563 (63.0%)	
Employment and study status				
Student	97 (11.7%)	195 (23.6%)	536 (64.7%)	
Employed	30 (19.2%)	41 (26.3%)	85 (54.5%)	0.010
Student & Employed	31 (13.4%)	71 (30.7%)	129 (55.8%)	
Others	10 (19.2%)	8 (15.4%)	34 (65.4%)	
Level of education				
Foundation	85 (14.4%)	160 (27.1%)	345 (58.5%)	
Undergraduate	36 (8.9%)	85 (20.9%)	285 (70.2%)	0.002
Postgraduate	19 (17.0%)	28 (25.0%)	65 (58.0%)	
Study subject				
Arts	32 (11.6%)	67 (24.3%)	177 (64.1%)	
Health	21 (12.6%)	29 (17.4%)	117 (70.1%)	0.046
Science	56 (12.7%)	103 (23.4%)	282 (63.9%)	
Others	25 (14.2%)	57 (32.4%)	94 (53.4%)	
Living arrangement				
Living alone (all the time)	27 (19.3%)	33 (23.6%)	80 (57.1%)	
Living alone from Monday - Friday	6 (13.0%)	15 (32.6%)	25 (54.3%)	0.162
Living with others	135 (12.5%)	265 (24.6%)	676 (62.8%)	
Smoking status				
Non-smoker	114 (12.3%)	221 (23.8%)	592 (63.9%)	
Less than or equal to 5 a day	16 (11.0%)	42 (28.8%)	88 (60.3%)	0.019
More than 5 a day	38 (19.7%)	52 (26.9%)	103 (53.4%)	
Alcohol				
Low	106 (12.6%)	212 (25.2%)	523 (62.2%)	
Medium	20 (16.5%)	32 (26.4%)	69 (57.0%)	0.646
High	36 (13.1%)	63 (22.9%)	176 (64.0%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

b. Support

	DIET – LACK OF SUPPORT			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Mixed**	**Not a barrier**	**Significance P value†**
Age groups				
18-19 yr olds	32 (7.0%)	32 (7.0%)	391 (85.9%)	
20-22 yr olds	23 (4.0%)	28 (4.9%)	517 (91.0%)	0.090
23+	12 (5.1%)	10 (4.2%)	215 (90.7%)	
Gender				
Male	21 (6.1%)	22 (6.4%)	301 (87.5%)	0.563
Female	45 (5.1%)	47 (5.3%)	795 (89.6%)	
Employment and study status				
Student	34 (4.1%)	52 (6.3%)	739 (89.6%)	
Employed	9 (5.8%)	5 (3.2%)	142 (91.0%)	0.041
Student & Employed	18 (7.9%)	12 (5.3%)	198 (86.8%)	
Others	6 (12.0%)	1 (2.0%)	43 (86.0%)	
Level of education				
Foundation	44 (7.5%)	43 (7.3%)	501 (85.2%)	
Undergraduate	8 (2.0%)	20 (5.0%)	376 (93.1%)	<0.001
Postgraduate	4 (3.6%)	4 (3.6%)	102 (92.7%)	
Study subject				
Arts	12 (4.4%)	18 (6.5%)	245 (89.1%)	
Health	11 (6.6%)	10 (6.0%)	146 (87.4%)	0.153
Science	17 (3.9%)	32 (7.3%)	390 (88.8%)	
Others	15 (8.6%)	6 (3.4%)	154 (88.0%)	
Living arrangement				
Living alone (all the time)	6 (4.4%)	6 (4.4%)	125 (91.2%)	
Living alone from Monday - Friday	3 (6.5%)	4 (8.7%)	39 (84.8%)	0.791
Living with others	58 (5.4%)	59 (5.5%)	954 (89.1%)	
Smoking status				
Non-smoker	53 (5.7%)	59 (6.4%)	811 (87.9%)	
Less than or equal to 5 a day	3 (2.1%)	7 (4.8%)	135 (93.1%)	0.055
More than 5 a day	11 (5.8%)	4 (2.1%)	175 (92.1%)	
Alcohol				
Low	49 (5.9%)	43 (5.1%)	743 (89.0%)	
Medium	8 (6.6%)	9 (7.4%)	104 (86.0%)	0.359
High	9 (3.3%)	17 (6.2%)	248 (90.5%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

c. Time

	DIET – LACK OF TIME		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	353 (75.9%)	112 (24.1%)	
20-22 yr olds	473 (81.4%)	108 (18.6%)	0.046
23+	200 (82.3%)	43 (17.7%)	
Gender			
Male	274 (78.5%)	75 (21.5%)	0.481‡
Female	731 (80.3%)	179 (19.7%)	
Employment and study status			
Student	663 (78.8%)	178 (21.2%)	
Employed	131 (81.9%)	29 (18.1%)	0.116
Student & Employed	195 (83.0%)	40 (17.0%)	
Others	36 (69.2%)	16 (30.8%)	
Level of education			
Foundation	464 (77.2%)	137 (22.8%)	
Undergraduate	337 (82.0%)	74 (18.0%)	
Postgraduate	96 (84.2%)	18 (15.8%)	0.079
Study subject			
Arts	219 (77.9%)	62 (22.1%)	
Health	136 (80.5%)	33 (19.5%)	
Science	361 (80.4%)	88 (19.6%)	0.835
Others	143 (80.8%)	34 (19.2%)	
Living arrangement			
Living alone (all the time)	112 (78.9%)	30 (21.1%)	
Living alone from Monday - Friday	34 (73.9%)	12 (26.1%)	0.612
Living with others	874 (79.8%)	221 (20.2%)	
Smoking status			
Non-smoker	737 (78.3%)	204 (21.7%)	
Less than or equal to 5 a day	124 (83.2%)	25 (16.8%)	0.158
More than 5 a day	163 (83.2%)	33 (16.8%)	
Alcohol			
Low	680 (79.6%)	174 (20.4%)	
Medium	104 (83.9%)	20 (16.1%)	0.460
High	220 (78.6%)	60 (21.4%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

d. Enjoyment

	DIET –LACK OF ENJOYMENT		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Don't enjoy healthy food**	**Enjoy healthy food**	**Significance P value†**
Age groups			
18-19 yr olds	86 (18.9%)	369 (81.1%)	
20-22 yr olds	82 (14.3%)	491 (85.7%)	0.142
23+	39 (16.4%)	199 (83.6%)	
Gender			
Male	69 (20.0%)	276 (80.0%)	0.032‡
Female	133 (14.9%)	758 (85.1%)	
Employment and study status			
Student	129 (15.6%)	699 (84.4%)	
Employed	26 (16.7%)	130 (83.3%)	0.174
Student & Employed	38 (16.5%)	192 (83.5%)	
Others	14 (27.5%)	37 (72.5%)	
Level of education			
Foundation	110 (18.7%)	479 (81.3%)	
Undergraduate	54 (13.3%)	352 (86.7%)	0.058
Postgraduate	22 (19.6%)	90 (80.4%)	
Study subject			
Arts	43 (15.6%)	233 (84.4%)	
Health	30 (18.0%)	137 (82.0%)	0.750
Science	71 (16.1%)	371 (83.9%)	
Others	33 (19.0%)	141 (81.0%)	
Living arrangement			
Living alone (all the time)	26 (18.7%)	113 (81.3%)	
Living alone from Monday - Friday	10 (21.7%)	36 (78.3%)	0.431
Living with others	171 (15.9%)	904 (84.1%)	
Smoking status			
Non-smoker	150 (16.2%)	777 (83.8%)	
Less than or equal to 5 a day	19 (13.1%)	126 (86.9%)	0.299
More than 5 a day	37 (19.4%)	154 (80.6%)	
Alcohol			
Low	135 (16.0%)	707 (84.0%)	
Medium	16 (13.3%)	104 (86.7%)	0.378
High	51 (18.7%)	222 (81.3%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

e. Access to food

	DIET – LACK OF ACCESS TO FOOD		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	285 (62.0%)	175 (38.0%)	
20-22 yr olds	347 (60.2%)	229 (39.8%)	
23+	153 (64.0%)	86 (36.0%)	0.588
Gender			
Male	206 (59.4%)	141 (40.6%)	
Female	561 (62.4%)	338 (37.6%)	0.330‡
Employment and study status			
Student	506 (60.7%)	327 (39.3%)	
Employed	86 (54.4%)	72 (45.6%)	0.020
Student & Employed	162 (69.5%)	71 (30.5%)	
Others	31 (62.0%)	19 (38.0%)	
Level of education			
Foundation	376 (63.5%)	216 (36.5%)	
Undergraduate	249 (60.9%)	160 (39.1%)	0.594
Postgraduate	73 (65.2%)	39 (34.8%)	
Study subject			
Arts	167 (60.1%)	111 (39.9%)	
Health	115 (67.6%)	55 (32.4%)	
Science	277 (62.5%)	166 (37.5%)	0.447
Others	112 (63.6%)	64 (36.4%)	
Living arrangement			
Living alone (all the time)	101 (71.6%)	40 (28.4%)	
Living alone from Monday - Friday	25 (54.3%)	21 (45.7%)	0.023
Living with others	655 (60.5%)	427 (39.5%)	
Smoking status			
Non-smoker	564 (60.3%)	371 (39.7%)	
Less than or equal to 5 a day	96 (65.3%)	51 (34.7%)	0.318
More than 5 a day	123 (64.7%)	67 (35.3%)	
Alcohol			
Low	507 (59.9%)	339 (40.1%)	
Medium	77 (62.1%)	47 (37.9%)	0.178
High	182 (66.2%)	93 (33.8%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

f. Money

	DIET –LACK OF MONEY		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	276 (59.9%)	185 (40.1%)	
20-22 yr olds	328 (56.4%)	254 (43.6%)	0.180
23+	126 (52.7%)	113 (47.3%)	
Gender			
Male	189 (54.2%)	160 (45.8%)	0.227‡
Female	524 (58.0%)	379 (42.0%)	
Employment and study status			
Student	503 (60.0%)	335 (40.0%)	
Employed	56 (35.2%)	103 (64.8%)	<0.001
Student & Employed	137 (59.1%)	95 (40.9%)	
Others	33 (63.5%)	19 (36.5%)	
Level of education			
Foundation	384 (64.2%)	214 (35.8%)	
Undergraduate	219 (53.4%)	191 (46.6%)	0.001
Postgraduate	59 (53.2%)	52 (46.8%)	
Study subject			
Arts	183 (65.4%)	97 (34.6%)	
Health	87 (52.1%)	80 (47.9%)	
Science	266 (59.5%)	181 (40.5%)	0.022
Others	96 (54.2%)	81 (45.8%)	
Living arrangement			
Living alone (all the time)	88 (62.0%)	54 (38.0%)	
Living alone from Monday - Friday	27 (58.7%)	19 (41.3%)	0.408
Living with others	611 (56.2%)	477 (43.8%)	
Smoking status			
Non-smoker	504 (53.8%)	432 (46.2%)	
Less than or equal to 5 a day	94 (63.1%)	55 (36.9%)	<0.001
More than 5 a day	131 (67.5%)	63 (32.5%)	
Alcohol			
Low	469 (55.2%)	380 (44.8%)	
Medium	67 (54.9%)	55 (45.1%)	0.074
High	176 (62.9%)	104 (37.1%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

Appendix 5.3 Association between physical activity facilitators and demographic/lifestyle factors

a. Health

	PA - HEALTH FACILITATOR				
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Strong facilitator**	**Mostly positive**	**Mostly negative**	**Not a facilitator**	**Significance P value†**
Age groups					
18-19 yr olds	399 (84.9%)	57 (12.1%)	9 (1.9%)	5 (1.1%)	
20-22 yr olds	498 (84.1%)	81 (13.7%)	10 (1.7%)	3 (0.5%)	0.705
23+	217 (87.5%)	25 (10.1%)	5 (2.0%)	1 (0.4%)	
Gender					
Male	279 (79.0%)	59 (16.7%)	10 (2.8%)	5 (1.4%)	0.001
Female	813 (87.6%)	98 (10.6%)	14 (1.5%)	3 (0.3%)	
Employment and study status					
Student	727 (84.9%)	105 (12.3%)	17 (2.0%)	7 (0.8%)	
Employed	144 (87.8%)	18 (11.0%)	2 (1.2%)	0 (0%)	0.263
Student & Employed	204 (86.4%)	27 (11.4%)	4 (1.7%)	1 (0.4%)	
Others	38 (71.7%)	13 (24.5%)	1 (1.9%)	1 (1.9%)	
Level of education					
Foundation	513 (84.4%)	79 (13.0%)	8 (1.3%)	8 (1.3%)	
Undergraduate	357 (85.2%)	50 (11.9%)	11 (2.6%)	1 (0.2%)	
Postgraduate	99 (85.3%)	15 (12.9%)	2 (1.7%)	0 (0%)	0.298
Study subject					
Arts	236 (83.4%)	39 (13.8%)	7 (2.5%)	1 (0.4%)	
Health	151 (87.3%)	19 (11.0%)	3 (1.7%)	0 (0%)	
Science	390 (86.1%)	53 (11.7%)	6 (1.3%)	4 (0.9%)	0.611
Others	152 (82.6%)	24 (13.0%)	5 (2.7%)	3 (1.6%)	
Living arrangement					
Living alone (all the time)	129 (89.6%)	13 (9.0%)	1 (0.7%)	1 (0.7%)	
Living alone from Monday -Friday	38 (82.6%)	7 (15.2%)	1 (2.2%)	0 (0%)	0.726
Living with others	941 (84.5%)	142 (12.8%)	22 (2.0%)	8 (0.7%)	
Smoking status					
Non-smoker	815 (85.1%)	121 (12.6%)	16 (1.7%)	6 (0.6%)	
Less than or equal to 5 a day	132 (88.6%)	13 (8.7%)	3 (2.0%)	1 (0.7%)	0.696
More than 5 a day	163 (81.9%)	29 (14.6%)	5 (2.5%)	2 (1.0%)	
Alcohol					
Low	746 (85.6%)	102 (11.7%)	16 (1.8%)	7 (0.8%)	
Medium	105 (84.0%)	16 (12.8%)	3 (2.4%)	1 (0.8%)	0.771
High	240 (84.5%)	39 (13.7%)	5 (1.8%)	0 (0%)	

† Pearson Chi-squared test

b. Appearance

	PA- APPEARANCE		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Important**	**Not important**	**Significance P value†**
Age groups			
18-19 yr olds	429 (91.3%)	41 (8.7%)	
20-22 yr olds	532 (90.2%)	58 (9.8%)	0.764
23+	225 (91.5%)	21 (8.5%)	
Gender			
Male	298 (84.4%)	55 (15.6%)	
Female	861 (93.2%)	63 (6.8%)	<0.001‡
Employment and study status			
Student	770 (90.3%)	83 (9.7%)	
Employed	151 (92.6%)	12 (7.4%)	
Student & Employed	218 (92.4%)	18 (7.6%)	0.446
Others	46 (86.8%)	7 (13.2%)	
Level of education			
Foundation	559 (92.2%)	47 (7.8%)	
Undergraduate	371 (88.8%)	47 (11.2%)	
Postgraduate	102 (88.7%)	13 (11.3%)	0.130
Study subject			
Arts	249 (88.6%)	32 (11.4%)	
Health	158 (91.3%)	15 (8.7%)	0.606
Science	413 (91.4%)	39 (8.6%)	
Others	168 (91.3%)	16 (8.7%)	
Living arrangement			
Living alone (all the time)	131 (91.0%)	13 (9.0%)	
Living alone from Monday - Friday	37 (80.4%)	9 (19.6%)	0.041
Living with others	1013 (91.3%)	96 (8.7%)	
Smoking status			
Non-smoker	864 (90.6%)	90 (9.4%)	
Less than or equal to 5 a day	139(93.3%)	10 (6.7%)	
More than 5 a day	179 (89.9%)	20 (10.1%)	0.513
Alcohol			
Low	778 (89.6%)	90 (10.4%)	
Medium	117 (93.6%)	8 (6.4%)	0.128
High	263 (92.9%)	20 (7.1%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

c. Subjective norm

	PA -SUBJECTIVE NORM			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Important**	**Mixed**	**Not important**	**Significance P value†**
Age groups				
18-19 yr olds	94 (20.6%)	93 (20.4%)	269 (59.0%)	
20-22 yr olds	81 (13.9%)	117 (20.0%)	386 (66.1%)	0.001
23+	25 (10.4%)	41 (17.1%)	174 (72.5%)	
Gender				
Male	70 (20.1%)	94 (26.9%)	185 (53.0%)	<0.001
Female	126 (14.0%)	148 (16.4%)	629 (69.7%)	
Employment and study status				
Student	126 (15.0%)	158 (18.8%)	555 (66.2%)	0.221
Employed	19 (11.9%)	36 (22.5%)	105 (65.6%)	
Student & Employed	47 (20.6%)	44 (19.3%)	137 (60.1%)	
Others	8 (15.4%)	13 (25.0%)	31 (59.6%)	
Level of education				
Foundation	113 (19.0%)	120 (20.1%)	363 (60.9%)	
Undergraduate	52 (12.7%)	74 (18.1%)	282 (69.1%)	0.036
Postgraduate	14 (12.6%)	20 (18.0%)	77 (69.4%)	
Study subject				
Arts	32 (11.6%)	46 (16.7%)	198 (71.7%)	
Health	36 (21.3%)	33 (19.5%)	100 (59.2%)	
Science	70 (15.8%)	83 (18.7%)	291 (65.5%)	0.014
Others	31 (17.3%)	46 (25.7%)	102 (57.0%)	
Living arrangement				
Living alone (all the time)	22 (15.7%)	27 (19.3%)	91 (65.0%)	
Living alone from Monday -Friday	6 (13.3%)	8 (17.8%)	31 (68.9%)	0.985
Living with others	171 (15.7%)	214 (19.7%)	703 (64.6%)	
Smoking status				
Non-smoker	130 (13.9%)	186 (19.9%)	619 (66.2%)	
Less than or equal to 5 a day	30 (20.4%)	31 (21.1%)	86 (58.5%)	0.056
More than 5 a day	40 (20.6%)	33 (17.0%)	121 (62.4%)	
Alcohol				
Low	125 (14.7%)	166 (19.5%)	559 (65.8%)	
Medium	21 (17.5%)	20 (16.7%)	79 (65.8%)	0.647
High	50 (17.8%)	56 (19.9%)	175 (62.3%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

d. Relaxing

	PA -RELAXING				
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Strong facilitator**	**Mostly positive**	**Mostly negative**	**Not a facilitator**	**Significance P value†**
Age groups					
18-19 yr olds	289 (63.2%)	109 (23.9%)	43 (9.4%)	16 (3.5%)	
20-22 yr olds	393 (67.3%)	119(20.4%)	61 (10.4%)	11 (1.9%)	0.276
23+	148 (60.9%)	64 (26.3%)	23 (9.5%)	8 (3.3%)	
Gender					
Male	210 (59.7%)	98 (27.8%)	35 (9.9%)	9 (2.6%)	0.056
Female	601 (66.6%)	187 (20.7%)	90 (10.0%)	25 (2.8%)	
Employment and study status					
Student	557 (66.3%)	188 (22.4%)	75 (8.9%)	20 (2.4%)	
Employed	93 (58.1%)	44 (27.5%)	21 (13.1%)	2 (1.3%)	0.083
Student & Employed	153 (65.9%)	46 (19.8%)	23 (9.9%)	10(4.3%)	
Others	27 (51.9%)	14 (26.9%)	8 (15.4%)	3 (5.8%)	
Level of education					
Foundation	392 (65.9%)	116 (19.5%)	64 (10.8%)	23 (3.9%)	
Undergraduate	264 (64.4%)	105 (25.6%)	35 (8.5%)	6 (1.5%)	0.027
Postgraduate	72 (63.2%)	32 (28.1%)	9 (7.9%)	1 (0.9%)	
Study subject					
Arts	167 (59.6%)	71 (25.4%)	31 (11.1%)	11 (3.9%)	
Health	127 (74.7%)	31 (18.2%)	10 (5.9%)	2 (1.2%)	
Science	298 (67.6%)	91 (20.6%)	45 (10.2%)	7 (1.6%)	0.040
Others	110 (60.8%)	45 (24.9%)	19 (10.5%)	7 (3.9%)	
Living arrangement					
Living alone (all the time)	85 (59.9%)	37 (26.1%)	15 (10.6%)	5 (3.5%)	
Living alone from Monday -Friday	28 (60.9%)	6 (13.0%)	9 (19.6%)	3 (6.5%)	0.086
Living with others	714 (65.6%)	246 (22.6%)	102 (9.4%)	27 (2.5%)	
Smoking status					
Non-smoker	628 (67.0%)	204 (21.8%)	82 (8.8%)	23 (2.5%)	
Less than or equal to 5 a day	93 (62.8%)	29 (19.6%)	21 (14.2%)	5 (3.4%)	0.017
More than 5 a day	106 (54.4%)	58 (29.7%)	24 (12.3%)	7 (3.6%)	
Alcohol					
Low	568 (66.3%)	194 (22.6%)	75 (8.8%)	20 (2.3%)	
Medium	72 (60.5%)	30 (25.2%)	15 (12.6%)	2 (1.7%)	0.165
High	171 (61.5%)	60 (21.6%)	35 (12.6%)	12 (4.3%)	

† Pearson Chi-squared test

e. Winning

	PA –WINNING AS FACILITATOR		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Important**	**Not important**	**Significance P value†**
Age groups			
18-19 yr olds	285 (61.7%)	177 (38.3%)	
20-22 yr olds	312 (53.2%)	275 (46.8%)	0.005
23+	123 (50.6%)	120 (49.4%)	
Gender			
Male	240 (68.4%)	111 (31.6%)	
Female	461 (50.5%)	451 (49.5%)	<0.001
Employment and study status			
Student	480 (56.9%)	364 (43.1%)	
Employed	84 (51.5%)	79 (48.5%)	0.588
Student & Employed	129 (55.4%)	104 (44.6%)	
Others	27 (51.9%)	25 (48.1%)	
Level of education			
Foundation	347 (57.8%)	253 (42.2%)	
Undergraduate	224 (54.4%)	188 (45.6%)	0.507
Postgraduate	66 (58.4%)	47 (41.6%)	
Study subject			
Arts	134 (47.9%)	146 (52.1%)	
Health	113 (66.1%)	58 (33.9%)	0.001
Science	258 (58.0%)	187 (42.0%)	
Others	106 (58.9%)	74 (41.1%)	
Living arrangement			
Living alone (all the time)	79 (55.2%)	64 (44.8%)	
Living alone from Monday - Friday	25 (54.3%)	21 (45.7%)	0.968
Living with others	613 (55.9%)	483 (44.1%)	
Smoking status			
Non-smoker	545 (57.7%)	399 (42.3%)	
Less than or equal to 5 a day	79 (53.4%)	69 (46.6%)	0.026
More than 5 a day	93 (47.4%)	103 (52.6%)	
Alcohol			
Low	471 (54.9%)	387 (45.1%)	
Medium	66 (53.7%)	57 (46.3%)	0.541
High	164 (58.4%)	117 (41.6%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

Appendix 5.4 Association between physical activity (PA) barriers and demographic/lifestyle factors

a. PA with opposite sex

	PA –BARRIER WITH OPPOSITE SEX		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	63 (13.6%)	399 (86.4%)	
20-22 yr olds	72 (12.2%)	519 (87.8%)	0.715
23+	29 (11.8%)	216 (88.2%)	
Gender			
Male	15 (4.3%)	336 (95.7%)	<0.001‡
Female	143 (15.6%)	774 (84.4%)	
Employment and study status			
Student	101 (11.9%)	750 (88.1%)	
Employed	18 (11.1%)	144 (88.9%)	
Student & Employed	34 (14.7%)	198 (85.3%)	0.167
Others	11 (21.2%)	41 (78.8%)	
Level of education			
Foundation	81 (13.4%)	523 (86.6%)	
Undergraduate	52 (12.5%)	364 (87.5%)	0.406
Postgraduate	10 (8.8%)	103 (91.2%)	
Study subject			
Arts	38 (13.5%)	243 (86.5%)	
Health	16 (9.3%)	156 (90.7%)	0.199
Science	65 (14.5%)	383 (85.5%)	
Others	18 (9.8%)	165 (90.2%)	
Living arrangement			
Living alone (all the time)	20 (14.0%)	123 (86.0%)	
Living alone from Monday - Friday	6 (13.0%)	40 (87.0%)	0.851
Living with others	136 (12.3%)	966 (87.7%)	
Smoking status			
Non-smoker	112 (11.8%)	836 (88.2%)	
Less than or equal to 5 a day	16 (10.7%)	133 (89.3%)	0.056
More than 5 a day	35 (17.8%)	162 (82.2%)	
Alcohol			
Low	107 (12.4%)	753 (87.6%)	
Medium	19 (15.4%)	104 (84.6%)	0.503
High	32 (11.3%)	252 (88.7%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

b. Competitive activities

	PA- BARRIER -*COMPETETIVE ACTIVITES*		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	139 (30.0%)	324 (70.0%)	
20-22 yr olds	201 (34.2%)	387 (65.8%)	0.330
23+	83 (33.7%)	163 (66.3%)	
Gender			
Male	67 (19.1%)	284 (80.9%)	<0.001‡
Female	346 (37.7%)	571 (62.3%)	
Employment and study status			
Student	279 (32.9%)	569 (67.1%)	
Employed	36 (22.2%)	126 (77.8%)	
Student & Employed	81 (34.6%)	153 (65.4%)	0.001
Others	27 (51.9%)	25 (48.1%)	
Level of education			
Foundation	202 (33.4%)	402 (66.6%)	
Undergraduate	144 (34.7%)	271 (65.3%)	0.830
Postgraduate	36 (31.9%)	77 (68.1%)	
Study subject			
Arts	111 (39.5%)	170 (60.5%)	
Health	62 (36.0%)	110 (64.0%)	
Science	150 (33.6%)	297 (66.4%)	<0.001
Others	38 (20.8%)	145 (79.2%)	
Living arrangement			
Living alone (all the time)	39 (27.3%)	104 (72.7%)	
Living alone from Monday - Friday	14 (30.4%)	32 (69.6%)	0.342
Living with others	366 (33.2%)	735 (66.8%)	
Smoking status			
Non-smoker	313 (32.9%)	637 (67.1%)	
Less than or equal to 5 a day	48 (32.7%)	99 (67.3%)	0.864
More than 5 a day	61 (31.0%)	136 (69.0%)	
Alcohol			
Low	296 (34.4%)	564 (65.6%)	
Medium	47 (37.9%)	77 (62.1%)	0.004
High	70 (24.7%)	213 (75.3%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

c. Lack of privacy

	PA - *LACK OF PRIVACY*		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	119 (25.8%)	343 (74.2%)	
20-22 yr olds	129 (21.9%)	459 (78.1%)	0.108
23+	70 (28.3%)	177 (71.7%)	
Gender			
Male	62 (17.7%)	289 (82.3%)	<0.001‡
Female	250 (27.3%)	666 (72.7%)	
Employment and study status			
Student	204 (24.0%)	645 (76.0%)	
Employed	29 (18.0%)	132 (82.0%)	
Student & Employed	68 (29.1%)	166 (70.9%)	0.041
Others	17 (32.7%)	35 (67.3%)	
Level of education			
Foundation	160 (26.5%)	444 (73.5%)	
Undergraduate	96 (23.2%)	318 (76.8%)	0.453
Postgraduate	27 (23.5%)	88 (76.5%)	
Study subject			
Arts	89 (31.6%)	193 (68.4%)	
Health	44 (25.4%)	129 (74.6%)	
Science	116 (26.0%)	330 (74.0%)	<0.001
Others	24 (13.1%)	159 (86.9%)	
Living arrangement			
Living alone (all the time)	42 (29.4%)	101 (70.6%)	
Living alone from Monday - Friday	17 (37.0%)	29 (63.0%)	0.045
Living with others	259 (23.5%)	842 (76.5%)	
Smoking status			
Non-smoker	230 (24.3%)	717 (75.7%)	
Less than or equal to 5 a day	31 (20.8%)	118 (79.2%)	0.251
More than 5 a day	56 (28.4%)	141 (71.6%)	
Alcohol			
Low	235 (27.4%)	624 (72.6%)	0.005
Medium	25 (20.2%)	99 (79.8%)	
High	52 (18.4%)	231 (81.6%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

d. Lack of information

	PA - *LACK OF INFORMATION*		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	185 (40.0%)	277 (60.0%)	0.179
20-22 yr olds	202 (34.5%)	383 (65.5%)	
23+	93 (38.0%)	152 (62.0%)	
Gender			
Male	102 (29.1%)	248 (70.9%)	
Female	369 (40.5%)	543 (59.5%)	<0.001‡
Employment and study status			
Student	288 (34.1%)	557 (65.9%)	
Employed	72 (44.4%)	90 (55.6%)	
Student & Employed	93 (40.1%)	139 (59.9%)	0.009
Others	26 (50.0%)	26 (50.0%)	
Level of education			
Foundation	238 (39.5%)	365 (60.5%)	
Undergraduate	139 (33.7%)	274 (66.3%)	0.068
Postgraduate	34 (30.6%)	77 (69.4%)	
Study subject			
Arts	98 (35.4%)	179 (64.6%)	
Health	67 (39.0%)	105 (61.0%)	0.783
Science	156 (34.9%)	291 (65.1%)	
Others	68 (37.4%)	114 (62.6%)	
Living arrangement			
Living alone (all the time)	56 (39.2%)	87 (60.8%)	
Living alone from Monday - Friday	17 (37.0%)	29 (63.0%)	0.876
Living with others	405 (37.0%)	691 (63.0%)	
Smoking status			
Non-smoker	336 (35.6%)	607 (64.4%)	
Less than or equal to 5 a day	44 (29.7%)	104 (70.3%)	<0.001
More than 5 a day	98 (49.7%)	99 (50.3%)	
Alcohol			
Low	324 (37.9%)	531 (62.1%)	
Medium	49 (39.8%)	74 (60.2%)	0.515
High	98 (34.6%)	185 (65.4%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

e. Disability

	PA - DISABILITY		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	18 (3.9%)	443 (96.1%)	
20-22 yr olds	27 (4.6%)	555 (95.4%)	0.291
23+	16 (6.5%)	229 (93.5%)	
Gender			
Male	19 (5.4%)	332 (94.6%)	0.555‡
Female	41 (4.5%)	866 (95.5%)	
Employment and study status			
Student	40 (4.8%)	802 (95.2%)	
Employed	1 (0.6%)	160 (99.4%)	<0.001
Student & Employed	12 (5.2%)	220 (94.8%)	
Others	8 (15.4%)	44 (84.6%)	
Level of education			
Foundation	25 (4.2%)	575 (95.8%)	
Undergraduate	24 (5.8%)	388 (94.2%)	0.286
Postgraduate	8 (7.1%)	104 (92.4%)	
Study subject			
Arts	24 (8.6%)	255 (91.4%)	
Health	8 (4.7%)	161 (95.3%)	0.012
Science	14 (3.1%)	431 (96.9%)	
Others	8 (4.4%)	175 (95.6%)	
Living arrangement			
Living alone (all the time)	11 (7.9%)	129 (92.1%)	
Living alone from Monday - Friday	3 (6.5%)	43 (93.5%)	0.149
Living with others	47 (4.3%)	1048 (95.7%)	
Smoking status			
Non-smoker	45 (4.8%)	897 (95.2%)	
Less than or equal to 5 a day	5 (3.4%)	142 (96.6%)	0.639
More than 5 a day	11 (5.6%)	186 (94.4%)	
Alcohol			
Low	45 (5.3%)	807 (94.7%)	
Medium	4 (3.3%)	118 (96.7%)	0.455
High	11 (3.9%)	272 (96.1%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

f. Adequate exercise

	BARIER - ADEQUATE EXERCISE		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Do adequate exercise already (barrier)**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	75 (16.3%)	384 (83.7%)	0.331
20-22 yr olds	96 (16.5%)	486 (83.5%)	
23+	50 (20.4%)	195 (79.6%)	
Gender			
Male	93 (26.6%)	257 (73.4%)	<0.001‡
Female	127 (14.0%)	779 (86.0%)	
Employment and study status			
Student	139 (16.5%)	702 (83.5%)	
Employed	31 (19.3%)	130 (80.7%)	0.383
Student & Employed	38 (16.5%)	193 (83.5%)	
Others	13 (25.0%)	39 (75.0%)	
Level of education			
Foundation	89 (14.8%)	511 (85.2%)	
Undergraduate	73 (17.8%)	338 (82.2%)	0.008
Postgraduate	30 (26.8%)	82 (73.2%)	
Study subject			
Arts	37 (13.3%)	241 (86.7%)	
Health	25 (14.7%)	145 (85.3%)	0.036
Science	82 (18.4%)	363 (81.6%)	
Others	42 (23.1%)	140 (76.9%)	
Living arrangement			
Living alone (all the time)	20 (14.1%)	122 (85.9%)	
Living alone from Monday - Friday	12 (26.1%)	34 (73.9%)	0.171
Living with others	187 (17.1%)	904 (82.9%)	
Smoking status			
Non-smoker	169 (18.0%)	770 (82.0%)	
Less than or equal to 5 a day	22 (15.0%)	125 (85.0%)	0.468
More than 5 a day	30 (15.2%)	168 (84.8%)	
Alcohol			
Low	157 (18.4%)	694 (81.6%)	
Medium	17 (13.9%)	105 (86.1%)	0.391
High	46 (16.3%)	236 (83.7%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

g. Bad weather

	PA BARRIER - BAD WEATHER		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	179 (43.0%)	237 (57.0%)	
20-22 yr olds	256 (48.5%)	272 (51.5%)	0.247
23+	103 (46.4%)	119 (53.6%)	
Gender			
Male	122 (38.7%)	193 (61.3%)	
Female	401 (48.8%)	421 (51.2%)	0.003‡
Employment and study status			
Student	395 (47.8%)	432 (52.2%)	
Employed	18 (23.4%)	59 (76.6%)	
Student & Employed	107 (48.0%)	116 (52.0%)	0.001
Others	17 (44.7%)	21 (55.3%)	
Level of education			
Foundation	263 (45.3%)	318 (54.7%)	
Undergraduate	193 (49.6%)	196 (50.4%)	0.195
Postgraduate	61 (53.0%)	54 (47.0%)	
Study subject			
Arts	118 (44.7%)	146 (55.3%)	
Health	91 (56.5%)	70 (43.5%)	0.035
Science	221 (49.6%)	225 (50.4%)	
Others	72 (42.1%)	99 (57.9%)	
Living arrangement			
Living alone (all the time)	58 (46.0%)	68 (54.0%)	
Living alone from Monday - Friday	19 (43.2%)	25 (56.8%)	0.920
Living with others	459 (46.3%)	532 (53.7%)	
Smoking status			
Non-smoker	405 (47.0%)	457 (53.0%)	
Less than or equal to 5 a day	64 (46.7%)	73 (53.3%)	0.436
More than 5 a day	69 (41.6%)	97 (58.4%)	
Alcohol			
Low	358 (46.7%)	409 (53.3%)	
Medium	54 (50.0%)	54 (50.0%)	0.350
High	111 (42.5%)	150 (57.5%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

h. Lack of company

	PA - LACK OF COMPANY				
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Strong barrier**	**Mostly a barrier**	**Not much of a barrier**	**Not a barrier**	**Significance P value†**
Age groups					
18-19 yr olds	50 (10.8%)	94 (20.3%)	114 (24.6%)	206 (44.4%)	
20-22 yr olds	53 (9.0%)	136 (23.0%)	137 (23.2%)	265 (44.8%)	0.779
23+	23 (9.3%)	47 (19.1%)	58 (23.6%)	118 (48.0%)	
Gender					
Male	29 (8.2%)	54 (15.3%)	68 (19.3%)	201 (57.1%)	<0.001
Female	95 (10.3%)	218 (23.7%)	233 (25.4%)	373(40.6%)	
Employment and study status					
Student	71 (8.4%)	184 (21.6%)	196 (23.1%)	399 (46.9%)	
Employed	16 (9.8%)	29 (17.8%)	46 (28.2%)	72 (44.2%)	0.191
Student & Employed	30 (12.8%)	53 (22.6%)	52 (22.1%)	100 (42.6%)	
Others	9 (17.3%)	11 (21.2%)	14 (26.9%)	18 (34.6%)	
Level of education					
Foundation	64 (10.6%)	128 (21.2%)	143 (23.7%)	269 (44.5%)	0.466
Undergraduate	34 (8.2%)	104 (24.9%)	88 (21.1%)	191 (45.8%)	
Postgraduate	9 (7.9%)	21 (18.4%)	28 (24.6%)	56 (49.1%)	
Study subject					
Arts	25 (8.9%)	61 (21.7%)	67 (23.8%)	128 (45.6%)	
Health	25 (14.5%)	32 (18.6%)	42 (24.4%)	73 (42.4%)	0.115
Science	41 (9.1%)	118 (26.2%)	98 (21.8%)	193 (42.9%)	
Others	14 (7.7%)	34 (18.6%)	39 (21.3%)	96 (52.5%)	
Living arrangement					
Living alone (all the time)	14 (9.8%)	33 (23.1%)	28 (19.6%)	68 (47.6%)	0.882
Living alone from Monday -Friday	3 (6.5%)	11 (23.9%)	12 (26.1%)	20 (43.5%)	
Living with others	108 (9.8%)	232 (21.0%)	268 (24.3%)	497 (45.0%)	
Smoking status					
Non-smoker	89 (9.3%)	202 (21.2%)	224 (23.5%)	438 (46.0%)	
Less than or equal to 5 a day	11 (7.4%)	34 (23.0%)	32 (21.6%)	71 (48.0%)	0.415
More than 5 a day	26 (13.2%)	40 (20.3%)	52 (26.4%)	79 (40.1%)	
Alcohol					
Low	85 (9.8%)	187 (21.7%)	200 (23.2%)	391 (45.3%)	
Medium	14 (11.4%)	30 (24.4%)	28 (22.8%)	51 (41.5%)	0.839
High	25 (8.8%)	55 (19.4%)	73 (25.7%)	131 (46.1%)	

† Pearson Chi-squared test

i. Lack of time

	PA - LACK OF TIME				
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Strong barrier**	**Mostly a barrier**	**Not much of a barrier**	**Not a barrier**	**Significance P value†**
Age groups					
18-19 yr olds	81 (17.3%)	203 (43.5%)	100 (21.4%)	83 (17.8%)	
20-22 yr olds	102 (17.3%)	281 (47.5%)	122 (20.6%)	86 (14.6%)	0.324
23+	54 (21.9%)	98 (39.7%)	56 (22.7%)	39 (15.8%)	
Gender					
Male	35 (9.9%)	132 (37.5%)	87 (24.7%)	98 (27.8%)	<0.001
Female	198 (21.5%)	432 (46.8%)	189 (20.5%)	104 (11.3%)	
Employment and study status					
Student	155 (18.2%)	436 (51.2%)	143 (16.8%)	118 (13.8%)	
Employed	7 (4.3%)	32 (19.5%)	84 (51.2%)	41 (25.0%)	<0.001
Student & Employed	71 (30.1%)	106 (44.9%)	29 (12.3%)	30 (12.7%)	
Others	4 (7.7%)	7 (13.5%)	22 (42.3%)	19 (36.5%)	
Level of education					
Foundation	117 (19.3%)	255 (42.1%)	122 (20.1%)	112 (18.5%)	<0.001
Undergraduate	79 (18.9%)	227 (54.2%)	67 (16.0%)	46 (11.0%)	
Postgraduate	30 (26.3%)	57 (50.0%)	19 (16.7%)	8 (7.0%)	
Study subject					
Arts	62 (22.0%)	112 (39.7%)	58 (20.6%)	50 (17.7%)	
Health	30 (17.2%)	105 (60.3%)	24 (13.8%)	15 (8.6%)	0.001
Science	98 (21.7%)	218 (48.3%)	76 (16.9%)	59 (13.1%)	
Others	30 (16.4%)	80 (43.7%)	35 (19.1%)	38 (20.8%)	
Living arrangement					
Living alone (all the time)	25 (17.5%)	65 (45.5%)	28 (19.6%)	25 (17.5%)	
Living alone from Monday -Friday	11 (23.9%)	15 (32.6%)	10 (21.7%)	10 (21.7%)	0.666
Living with others	201 (18.1%)	501 (45.2%)	237 (21.4%)	170 (15.3%)	
Smoking status					
Non-smoker	172 (18.0%)	441 (46.2%)	190 (19.9%)	152 (15.9%)	
Less than or equal to 5 a day	25 (16.9%)	64 (43.2%)	32 (21.6%)	27 (18.2%)	0.180
More than 5 a day	40 (20.2%)	75 (37.9%)	55 (27.8%)	28 (14.1%)	
Alcohol					
Low	166 (19.1%)	372 (42.9%)	188 (21.7%)	141 (16.3%)	
Medium	25 (20.3%)	63 (51.2%)	24 (19.5%)	11 (8.9%)	
High	42 (14.8%)	129 (45.4%)	63 (22.2%)	50 (17.6%)	0.176

† Pearson Chi-squared test

j. Choice of activities

	PA- LACK OF CHOICES OF ACTIVITIES			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Mixed**	**Not a barrier**	**Significance P value†**
Age groups				
18-19 yr olds	29 (6.3%)	118 (25.8%)	310 (67.8%)	
20-22 yr olds	39 (6.7%)	125 (21.6%)	415 (71.7%)	0.530
23+	19 (7.8%)	59 (24.3%)	165 (67.9%)	
Gender				
Male	15 (4.3%)	68 (19.5%)	266 (76.2%)	0.004
Female	70 (7.8%)	226 (25.1%)	604 (67.1%)	
Employment and study status				
Student	45 (5.4%)	210 (25.1%)	581 (69.5%)	
Employed	17 (10.6%)	21 (13.0%)	123 (76.4%)	0.002
Student & Employed	18 (7.9%)	61 (26.6%)	150 (65.5%)	
Others	7 (13.5%)	10 (19.2%)	35 (67.3%)	
Level of education				
Foundation	42 (7.0%)	161 (27.0%)	394 (66.0%)	
Undergraduate	26 (6.4%)	91 (22.4%)	290 (71.3%)	0.523
Postgraduate	7 (6.3%)	28 (25.2%)	76 (68.5%)	
Study subject				
Arts	25 (9.1%)	74 (26.9%)	176 (64.0%)	
Health	17 (10.1%)	39 (23.1%)	113 (66.9%)	0.002
Science	24 (5.4%)	123 (27.9%)	294 (66.7%)	
Others	5 (2.8%)	32 (17.7%)	144 (79.6%)	
Living arrangement				
Living alone (all the time)	7 (5.0%)	32 (22.7%)	102 (72.3%)	
Living alone from Monday - Friday	4 (8.7%)	15 (32.6%)	27 (58.7%)	0.462
Living with others	76 (7.0%)	253 (23.3%)	756 (69.7%)	
Smoking status				
Non-smoker	64 (6.9%)	213 (22.8%)	657 (70.3%)	
Less than or equal to 5 a day	8 (5.4%)	30 (20.4%)	109 (74.1%)	0.134
More than 5 a day	15 (7.7%)	59 (30.1%)	122 (62.2%)	
Alcohol				
Low	60 (7.1%)	201 (23.7%)	586 (69.2%)	
Medium	9 (7.6%)	28 (23.5%)	82 (68.9%)	0.923
High	16 (5.7%)	65 (23.0%)	201 (71.3%)	

† Pearson Chi-squared test

k. Lack of facilities

	PA - LACK OF FACILITIES			
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Mixed**	**Not a barrier**	**Significance P value†**
Age groups				
18-19 yr olds	73 (16.0%)	107 (23.4%)	277 (60.6%)	
20-22 yr olds	75 (12.9%)	153 (26.2%)	355 (60.9%)	0.530
23+	39 (15.9%)	57 (23.3%)	149 (60.8%)	
Gender				
Male	45 (12.9%)	73 (20.9%)	231 (66.2%)	0.056
Female	139 (15.3%)	234 (25.8%)	533 (58.8%)	
Employment and study status				
Student	122 (14.5%)	210 (24.9%)	511 (60.6%)	
Employed	13 (8.2%)	38 (23.9%)	108 (67.9%)	0.085
Student & Employed	40 (17.3%)	59 (25.5%)	132 (57.1%)	
Others	12 (23.5%)	10 (19.6%)	29 (56.9%)	
Level of education				
Foundation	92 (15.4%)	139 (23.3%)	366 (61.3%)	
Undergraduate	55 (13.3%)	113 (27.4%)	245 (59.3%)	0.523
Postgraduate	17 (15.2%)	24 (21.4%)	71 (63.4%)	
Study subject				
Arts	42 (15.1%)	71 (25.5%)	165 (59.4%)	
Health	38 (22.5%)	39 (23.1%)	92 (54.4%)	0.085
Science	58 (13.1%)	111 (25.0%)	275 (61.9%)	
Others	21 (11.5%)	43 (23.6%)	118 (64.8%)	
Living arrangement				
Living alone (all the time)	15 (10.6%)	42 (29.8%)	84 (59.6%)	
Living alone from Monday - Friday	5 (10.9%)	11 (23.9%)	30 (65.2%)	0.418
Living with others	164 (15.0%)	263 (24.1%)	664 (60.9%)	
Smoking status				
Non-smoker	139 (14.8%)	228 (24.2%)	574 (61.0%)	
Less than or equal to 5 a day	21 (14.3%)	32 (21.8%)	94 (63.9%)	0.550
More than 5 a day	27 (13.8%)	57 (29.2%)	111 (56.9%)	
Alcohol				
Low	132 (15.5%)	204 (24.0%)	513 (60.4%)	
Medium	18 (14.8%)	31 (25.4%)	73 (59.8%)	0.698
High	34 (12.0%)	72 (25.4%)	177 (62.5%)	

† Pearson Chi-squared test

I. Lack of money

	PA- LACK OF MONEY		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Is a barrier**	**Not a barrier**	**Significance P value†**
Age groups			
18-19 yr olds	284 (60.9%)	182 (39.1%)	
20-22 yr olds	329 (55.9%)	260 (44.1%)	0.163
23+	136 (54.8%)	112 (45.2%)	
Gender			
Male	165 (46.7%)	188 (53.3%)	<0.001‡
Female	570 (62.0%)	350 (38.0%)	
Employment and study status			
Student	485 (57.0%)	366 (43.0%)	
Employed	78 (47.9%)	85 (52.1%)	
Student & Employed	149 (63.4%)	86 (36.6%)	0.007
Others	36 (67.9%)	17 (32.1%)	
Level of education			
Foundation	380 (62.7%)	226 (37.3%)	
Undergraduate	222 (53.4%)	194 (46.6%)	0.006
Postgraduate	61 (53.5%)	53 (46.5%)	
Study subject			
Arts	172 (61.6%)	107 (38.4%)	
Health	99 (56.9%)	75 (43.1%)	0.223
Science	262 (58.2%)	188 (41.8%)	
Others	95 (51.9%)	88 (48.1%)	
Living arrangement			
Living alone (all the time)	83 (57.6%)	61 (42.4%)	
Living alone from Monday - Friday	28 (60.9%)	18 (39.1%)	0.892
Living with others	634 (57.3%)	472 (42.7%)	
Smoking status			
Non-smoker	519 (54.5%)	434 (45.5%)	
Less than or equal to 5 a day	92 (62.2%)	56 (37.8%)	0.001
More than 5 a day	135 (68.2%)	63 (31.8%)	
Alcohol			
Low	479 (55.4%)	386 (44.6%)	
Medium	74 (60.2%)	49 (39.8%)	0.031
High	182 (64.1%)	102 (35.9%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

Appendix 5.5 Association between physical activity preferences and demographic/lifestyle factors

a. Competitive sports

	PA- PREFERNCES COMPETETIVE SPORTS		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Prefer**	**Don't prefer**	**Significance P value†**
Age groups			
18-19 yr olds	224 (48.8%)	235 (51.2%)	
20-22 yr olds	232 (40.1%)	347 (59.9%)	0.004
23+	92 (37.7%)	152 (62.3%)	
Gender			
Male	232 (66.9%)	115 (33.1%)	<0.001‡
Female	306 (33.7%)	601 (66.3%)	
Employment and study status			
Student	374 (44.6%)	465 (55.4%)	
Employed	61 (37.9%)	100 (62.1%)	0.282
Student & Employed	90 (39.3%)	139 (60.7%)	
Others	22 (42.3%)	30 (57.7%)	
Level of education			
Foundation	281 (47.1%)	315 (52.9%)	
Undergraduate	167 (41.2%)	238 (58.8%)	0.093
Postgraduate	45 (39.1%)	70 (60.9%)	
Study subject			
Arts	105 (38.0%)	171 (62.0%)	
Health	88 (52.1%)	81 (47.9%)	0.004
Science	186 (42.1%)	256 (57.9%)	
Others	94 (51.4%)	89 (48.6%)	
Living arrangement			
Living alone (all the time)	60 (42.0%)	83 (58.0%)	
Living alone from Monday - Friday	21 (45.7%)	25 (54.3%)	0.906
Living with others	463 (42.6%)	623 (57.4%)	
Smoking status			
Non-smoker	399 (42.5%)	539 (57.5%)	
Less than or equal to 5 a day	67 (45.3%)	81 (54.7%)	0.781
More than 5 a day	80 (41.7%)	112 (58.3%)	
Alcohol			
Low	349 (40.9%)	505 (59.1%)	
Medium	48 (39.7%)	73 (60.3%)	0.012
High	141 (50.7%)	137 (49.3%)	

† Pearson Chi-squared test; ‡ Continuity correction (2x2 table)

b. Non - competitive sports

	PA- NON - COMPETETIVE SPORTS/ACTIVITIES		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Prefer**	**Don't prefer**	**Significance P value†**
Age groups			
18-19 yr olds	392 (85.4%)	67 (14.6%)	
20-22 yr olds	539 (91.8%)	48 (8.2%)	0.002
23+	225 (91.5%)	21 (8.5%)	
Gender			
Male	258 (75.9%)	82 (24.1%)	<0.001‡
Female	873 (94.7%)	49 (5.3%)	
Employment and study status			
Student	755 (89.6%)	88 (10.4%)	
Employed	147 (91.9%)	13 (8.1%)	0.591
Student & Employed	208 (88.1%)	28 (11.9%)	
Others	45 (86.5%)	7 (13.5%)	
Level of education			
Foundation	521 (86.4%)	82 (13.6%)	
Undergraduate	380 (92.0%)	33 (8.0%)	0.004
Postgraduate	107 (93.9%)	7 (6.1%)	
Study subject			
Arts	249 (89.6%)	29 (10.4%)	
Health	160 (92.0%)	14 (8.0%)	
Science	407 (91.1%)	40 (8.9%)	0.004
Others	148 (81.8%)	33 (18.2%)	
Living arrangement			
Living alone (all the time)	125 (88.0%)	17 (12.0%)	
Living alone from Monday - Friday	38 (82.6%)	8 (17.4%)	0.232
Living with others	988 (90.0%)	110 (10%)	
Smoking status			
Non-smoker	851 (89.9%)	96 (10.1%)	
Less than or equal to 5 a day	133 (90.5%)	14 (9.5%)	0.482
More than 5 a day	169 (87.1%)	25 (12.9%)	
Alcohol			
Low	774 (90.0%)	86 (10.0%)	
Medium	108 (87.8%)	15 (12.2%)	0.734
High	248 (89.2%)	30 (10.8%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

c. Active living

	PA PREFERNCE -ACTIVE LIVING		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Prefer**	**Don't prefer**	**Significance P value†**
Age groups			
18-19 yr olds	389 (84.9%)	69 (15.1%)	
20-22 yr olds	502 (86.3%)	80 (13.7%)	0.098
23+	223 (90.7%)	23 (9.3%)	
Gender			
Male	277 (81.2%)	64 (18.8%)	
Female	814 (88.9%)	102 (11.1%)	<0.001‡
Employment and study status			
Student	731 (87.1%)	108 (12.9%)	
Employed	142 (88.8%)	18 (11.3%)	0.432
Student & Employed	198 (84.3%)	37 (15.7%)	
Others	42 (82.4%)	9 (17.6%)	
Level of education			
Foundation	508 (84.8%)	91 (15.2%)	
Undergraduate	352 (86.3%)	56 (13.7%)	0.111
Postgraduate	106 (92.2%)	9 (7.8%)	
Study subject			
Arts	233 (84.1%)	44 (15.9%)	
Health	161 (93.1%)	12 (6.9%)	0.001
Science	392 (88.3%)	52 (11.7%)	
Others	144 (79.6%)	37 (20.4%)	
Living arrangement			
Living alone (all the time)	124 (87.3%)	18 (12.7%)	
Living alone from Monday - Friday	41 (89.1%)	5 (10.9%)	0.868
Living with others	945 (86.6%)	146 (13.4%)	
Smoking status			
Non-smoker	828 (87.9%)	114 (12.1%)	
Less than or equal to 5 a day	124 (83.8%)	24 (16.2%)	0.066
More than 5 a day	158 (82.3%)	34 (17.7%)	
Alcohol			
Low	746 (86.9%)	112 (13.1%)	
Medium	107 (88.4%)	14 (11.6%)	0.716
High	237 (85.6%)	40 (14.4%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table)

d. Go to gym

	PA PREFERENCE - GO TO GYM		
DEMOGRAPHIC AND LIFESTYLE FACTORS	**Prefer**	**Don't prefer**	**Significance P value†**
Age groups			
18-19 yr olds	341 (73.7%)	122 (26.3%)	
20-22 yr olds	398 (68.0%)	187 (32.0%)	0.031
23+	160 (64.8%)	87 (35.2%)	
Gender			
Male	254 (73.0%)	94 (27.0%)	
Female	622 (67.8%)	295 (32.2%)	0.077‡
Employment and study status			
Student	592 (69.8%)	256 (30.2%)	
Employed	107 (66.0%)	55 (34.0%)	0.650
Student & Employed	165 (71.1%)	67 (28.9%)	
Others	34 (65.4%)	18 (34.6%)	
Level of education			
Foundation	428 (71.0%)	175 (29.0%)	
Undergraduate	282 (68.4%)	130 (31.6%)	0.095
Postgraduate	70 (60.9%)	45 (39.1%)	
Study subject			
Arts	179 (63.5%)	103 (36.5%)	
Health	117 (68.0%)	55 (32.0%)	0.023
Science	309 (69.6%)	135 (30.4%)	
Others	140 (76.9%)	42 (23.1%)	
Living arrangement			
Living alone (all the time)	111 (77.6%)	32 (22.4%)	
Living alone from Monday - Friday	38 (82.6%)	8 (17.4%)	0.008
Living with others	746 (67.9%)	353 (32.1%)	
Smoking status			
Non-smoker	647 (68.5%)	297 (31.5%)	
Less than or equal to 5 a day	105 (70.9%)	43 (29.1%)	0.517
More than 5 a day	144 (72.4%)	55 (27.6%)	
Alcohol			
Low	588 (68.1%)	275 (31.9%)	
Medium	81 (66.4%)	41 (33.6%)	0.155
High	206 (73.8%)	73 (26.2%)	

† Pearson Chi-squared test; ‡ Continuity correction(2x2 table

Appendix 6.1 Keys used for statistical modelling

AgegpsMOD = age groups	Diet attitudepleasant = diet attitude that it was pleasant	PAattitudedifficult= physical acitvity attitude that it was difficult
Employstat = Employment status	Dietattitude....2 = attitude with group1 and 2 grouped together due to small numbers	PAattitude.....2 = attitude with group1 and 2 grouped together due to small numbers
Subject = subject of study for students	Dietfacsubjectivenorm = subjective norm for diet	PA_SN_support = physical activity subjective norm
q9 =living arrangement	Diet attitudeintention = diet intention	PAPBC = physical activity perceived behavioural control
Quantitysmk = amount of cigarette smoked	Dietbarriercook = barriers to cooking	PAintentionLOG = Physical activity intention
Alcoholcat = amount of alcohol consumed	Dietbarriersupport =lack of support as barrier	PAbarrieroppositesex = exercise with opposite sex is a barrier
WTperceptionMOD = weight perception	Dietfachealth = health as diet facilitator	PAintentionLOGMOD =Physical activity intention logistic model
	Dietfacappear = appearance as diet facilitator	
	dietchoicC = having choices as diet facilitator	
	Dietfacinfo = information as diet facilitator	
	Dietfacoppur = Opportunities as diet facilitators	
	Dietfacsupport = support as diet facilitator	
	DietintentionLOGMOD = diet intention logistic model	

Appendix 6.2 Stage 1 Diet intention model

DietIntentionLOGMOD agree (ref) vs disagree [neutral removed]

by Atts + SN + I + Demos

Demographics	**Attitudes**	**Subjective Norm**
agegpsMOD ‡	Dietattitudepleasant ‡†	Dietfacsubjectivenorm
gender ‡†	Dietattitudestupid2 ‡	
Employstat‡ †	Dietattitudehealth2 ‡†	
YearofStudy	Dietattitudeworthiness2	
subject		
quantitysmk		
q9		
Ps R^2= .165	Ps R^2= .511	Not sig
Combined Diet intention Model		Ps R^2=0.539;

‡ Significant in each block model

† Significant in the combined model

Appendix 6.3 Stage 2 and 3 Diet behaviour model

Stage 2 and 3: Full Diet Behaviour Model by
Demos (sig in behaviour and intention models) + Intention + Atts (sig in behaviour model) + wtperception + I + Barrs and Facs from Behaviour model

a) Diet Behaviour **Fruit and Vegetable consumption**–Logistic regression Total amount– adequate (ref), not Adequate

Stages	Demographics	Attitudes	Subjective Norm	Intenition	Barriers	Facilitators
	agegpsMOD	Dietattitudepleasant † §¶ ‡	Dietfacsubjective norm	DietattitudeinntentionLOG§¶	Dietbarriercook §¶	Dietfachealth
	gender †¶	Dietattitudestupid2			Dietbarriersupport	Dietfacappear §¶ ‡
	Employstat †¶	Dietattitudehealth2 †¶			Dietbarriertime §¶ ‡	dietchoiceC
	YearofStudy	Dietattitudeworthiness2			Dietbarrierenjoy §¶	dietfacinfo §¶
	subject §‡¶				Dietbarrieraccess	dietfacoppur
	quantitysmk	WTperceptionMOD			Dietbarriermoney §¶	dietfacsupport
	q9					
Stage 2	Ps $R^{2=}$ 0.030	Ps $R^{2=}$ 0.018	Not sig	Ps $R^{2=}$ 0.003	Ps $R^{2=}$ 0.014	Ps $R^{2=}$ 0.026
Stage 3	Full Behaviour (Activity) Model Ps R^2= 0.201, n=819					

§ Sig for each behaviour block model (Demos, Atts, SN, PBC, I, Barra, Facs)
† Sig from combined intention model
¶ included in for full behaviour model
‡ Sig for full behaviour model

b) Diet Behaviour **Regular Meal Patterns**– Logistic regression Total amount– Regular(ref), not regular

Stages	Demographics	Attitudes	Subjective Norm	Intention	Barriers	Facilitators
	agegpsMOD	Dietattitudepleasant †¶	Dietfacsubjectivenorm	Dietattitudeinntention LOG §¶	Dietbarriercook §¶	Dietfachealth
	gender †§¶‡	Dietattitudestupid2			Dietbarriersupport	Dietfacappear §¶‡
	Employstat †§¶‡	Dietattitudehealth2 †¶			Dietbarriertime	dietchoiceC
	YearofStudy	Dietattitudeworthiness2 §¶			Dietbarrierenjoy §¶	dietfacinfo §¶
	subject				Dietbarrieraccess	dietfacoppur
	quantitysmk §¶‡	WTperceptionMOD			Dietbarriermoney§¶‡	dietfacsupport
	q9					
Stage 2	Ps $R^{2=}$ 0.113	Ps $R^{2=}$ 0.031	Not sig	Ps $R^{2=}$ 0.007	Ps $R^{2=}$ 0.028	Ps $R^{2=}$ 0.026
Stage 3	Full Behaviour (Activity) Model Ps R^2= 0.111, n=923					

c) Diet Behaviour **Snacking** – nominal regression Total amount– Low(ref), med, High

Stages	Demographics	Attitudes	Subjective Norm	Intention	Barriers	Facilitators
	agegpsMOD §¶‡	Dietattitudepleasant †§¶‡	Dietfacsubjectivenorm	DietintentionLogMod	Dietbarriercook	Dietfachealth §¶
	gender †§¶‡	Dietattitudestupid2			Dietbarriersupport §¶‡	Dietfacappear
	Employstat †¶	Dietattitudehealth2 †¶			Dietbarriertime	dietchoiceC
	YearofStudy §¶	Dietattitudeworthiness2			Dietbarrierenjoy §¶	dietfacinfo
	subject §¶				Dietbarrieraccess	dietfacoppur
	quantitysmk §¶‡	WTperceptionMOD ¶‡			Dietbarriermoney	dietfacsupport
	q9 §¶					
Stage 2	Ps $R^{2=}$ 0.036	Ps $R^{2=}$ 0.019	Not sig	Not sig	Ps $R^{2=}$ 0.014	Ps $R^{2=}$ 0.004
Stage 3	Full Behaviour (Activity) Model Ps R^2= 0.056, n=1109					

§ Sig for each behaviour block model (Demos, Atts, SN, PBC, I, Barra, Facs)
† Sig from combined intention model
¶ included in for full behaviour model
‡ Sig for full behaviour model

Appendix 6.4 Stage 1 Physical activity intention model

Stage1: PAintentionLOGMOD agree(ref) VS Not agree (Logistic regression)

by Atts + SN + I + Demos

Demographics	**Attitudes**	**Subjective Norm**	**PBC**
agegpsMOD	PAattitudedifficult ‡	PA_SN_support	PAPBC ‡†
gender‡ †	PAattituderelax		
Employstat‡ †	PAattitudeenjoy ‡†		
YearofStudy	PAattitudehealthy2 ‡†		
subject			
quantitysmk			
q9			
alcoholcat			
PS R^2= .186	PS R^2= 0.349	Not sig	PS R^2= .028
Combined PA intention Model		Ps R^2=0.553;	

‡ Significant in each block model

† Significant in the combined PA intention model

Appendix 6.5 Stage 2 and 3 Physical activity behaviour model

Stage 2 and 3: Full Physical Activity Behaviour Model by
Demos (sig in behaviour and intention models) + Intention + Atts (sig in behaviour model) + wtperception + I + Barrs and Facs from Behaviour model

a) Active Exercise – Logistic regression Forward Stepwise: Do enough (ref) VS don't do enough

Stages	Demographics	Attitudes	Subjective Norm	PBC	Intentions	Barriers	Facilitators
	agegpsMOD	PAattitudedifficult §†¶ ‡	PA_SN_ support	PAPBC §†¶ ‡	PAintentionLOG §¶	PAbarrieroppositesex	PAFacilitatorWin §¶
	gender §†¶	PAattituderelax				PAbarriercompetition	PAFacilitatorappearance
	Employstat †¶	PAattitudeenjoy † ¶				PAbarrierprivacy	PAHealthFacilitator
	YearofStudy	PAattitudehealthy2 †¶				PAbarriermoney	PARelaxFacilitator
	subject					PAbarrierinfo	
	quantitysmk	WtPerceptionMOD ¶				PAbarrierdisability	
	q9					PAbarrierenoughexercise §¶ ‡	
	alcoholcat					PAbarrierchoice §¶	
						PAbarrierfacility	
						PAbarrierBadweather	
						PACompanyBarrier	
						PATimeBarrier §¶	
Stage 2	Ps $R^{2=}$ 0.026	Ps $R^{2=}$ 0.447	Not sig	Ps $R^{2=}$ 0.323	Ps $R^{2=}$ 0.057	Ps $R^{2=}$ 0.146	Ps $R^{2=}$ 0.027
Stage 3	Full Behaviour (Activity) Model Ps R^2= 0.513, n=1146						

§ Sig for each behaviour block model (Demos, Atts, SN, PBC, I, Barra, Facs)
† Sig from combined intention model
¶ included in for full behaviour model
‡ Sig for full behaviour model

b) Sedentary TV – Logistic regression (stepwise selection): <4hr(ref) VS >4 hrs

Stages	Demographics	Attitudes	Subjective Norm	PBC	Intentions	Barriers	Facilitators
	agegpsMOD	PAattitudedifficult §¶	PA_SN_support	PAPBC †¶	PAintentionLOGMOD §¶	PAbarrieroppositesex	PAFacilitatorWin §¶
	gender §†¶	PAattituderelax				PAbarriercompetition	PAFacilitatorappearance
	Employstat §†¶	PAattitudeenjoy §†¶‡				PAbarrierprivacy	PAHealthFacilitator ¶
	YearofStudy	PAattitudehealthy2 †¶				PAbarriermoney	PARelaxFacilitator
	subject					PAbarrierinfo	
	quantitysmk	WtPerceptionMOD ¶‡ *borderline*				PAbarrierdisability §¶	
	q9					PAbarrierenoughexercise	
	alcoholcat					PAbarrierchoice §¶‡	
						PAbarrierfacility	
						PAbarrierBadweather §¶‡	
						PACompanyBarrier	
						PATimeBarrier	
Stage 2	Ps $R^{2=}$ 0.032	Ps $R^{2=}$ 0.068	Not sig	Not sig	Ps $R^{2=}$ 0.031	Ps $R^{2=}$ 0.056	Ps $R^{2=}$ 0.020
Stage 3	Full Behaviour (Sedentary TV) Model Ps R^2= 0.101, n=927						

§ Sig for each behaviour block model (Demos, Atts, SN, PBC, I, Barra, Facs)
† Sig from combined intention model
¶ included in for full behaviour model
‡ Sig for full behaviour model

c) Sedentary Computer – Logistic regression (stepwise selection): <4hr(ref) VS >4 hrs

Stages	Demographics	Attitudes	Subjective Norm	PBC	Intentions	Barriers	Facilitators
	agegpsMOD	PAattitudedifficult	PA_SN_support	PAPBC †¶	PAintentionLOG¶	PAbarrieroppositesex	PAFacilitatorWin
	gender †§¶ ‡	PAattituderelax				PAbarriercompetition	PAFacilitatorappearance
	Employstat †¶	PAattitudeenjoy † §¶				PAbarrierprivacy	PAHealthFacilitator §¶
	YearofStudy §¶ ‡	PAattitudehealthy2 †¶				PAbarriermoney	PARelaxFacilitator
	subject					PAbarrierinfo	
	quantitysmk	WtPerceptionMOD *borderline*				PAbarrierdisability §¶	
	q9					PAbarrierenoughexercise	
	alcoholcat					PAbarrierchoice	
						PAbarrierfacility	
						PAbarrierBadweather	
						PACompanyBarrier	
						PATimeBarrier	
Stage 2	Ps $R^{2=}$ 0.057	Ps $R^{2=}$ 0.014	Not sig	Not sig	Not sig	Ps $R^{2=}$ 0.007	Ps $R^{2=}$ 0.010
Stage 3	Full Behaviour (Sedentary Computer) Model Ps R^2=0.058, n=1243						

§ Sig for each behaviour block model (Demos, Atts, SN, PBC, I, Barra, Facs)
† Sig from combined intention model
¶ included in for full behaviour model
‡ Sig for full behaviour model

Appendix 7.1 Information letter for focus groups

INFORMATION LETTER

"Young People's Perceptions of Leading a Healthy Lifestyle: An Exploratory Study"

What is the study about?
The study is entitled "Young People's Perceptions of Leading a Healthy Lifestyle: An Exploratory Study". It aims to improve our understanding of attitudes to leading a healthy lifestyle in your age group. We also want to find out what makes it difficult to realise any intentions you may have to follow a healthier lifestyle. This information can inform policy makers and those interested in improving Scotland's health in a way that can help others like you.

Who is carrying out the study?
The study is an MSc project conducted by Dr Catriona Hughes and supervised by staff at the University of Aberdeen. It is part of a larger project being carried out by the University of Aberdeen in conjunction with NHS Grampian.

What will it involve?
If you are willing to participate we would ask you to attend a small focus group of between 6-8 participants. The participants in your group would be individuals around your age and from your institution. We will be conducting focus groups amongst students from the University of Aberdeen, The Robert Gordon University, Aberdeen College and members of community groups. We would anticipate that the focus groups would last between 1 and 1½ hours. The discussion is about what you believe and your experiences - there are no right or wrong answers! The interview will be taped so that we can remind ourselves of all the points raised. **You will be anonymous** in these written records and in any reports that will be written from them. The tapes will be destroyed at the end of the study.

At the time of the focus group we will ask you to complete a short questionnaire giving us details of your age, background, weight and height. **Again information will be treated anonymously.**

The information we gather from this study will be treated confidentially. All quotes used in any written reports produced by the researchers will be presented anonymously.

WE WOULD LIKE TO THANK YOU FOR YOUR PARTICIPATION WITH A £10 HIGH STREET VOUCHER.

What if I change my mind?
You are free to change your mind and withdraw from the focus group at any time.

Any more questions?
If there is anything you would like to discuss about the study before you decide to participate please contact us. You can email catriona.hughes@nhs.net, phone Dr Amudha Poobalan at the Department of Public Health at the University of Aberdeen (tel: 01224 555 934), or write to us at the Department.

We would be very grateful for your participation.

Dr Catriona Hughes Dr Amudha Poobalan Prof W Cairns S Smith

Appendix 7.2 Focus groups topic guide

DIET

- Diet behaviour
- Importance and perceived relevance of healthy eating at that stage in life and in the future (attitudes)
- Positive and negative outcome expectations (anticipatory outcome of a behaviour)
- Perceived barriers to eating healthily
- Factors which do facilitate/may help
- Self-efficacy or Perceived Behavioural Control

Q1. In general, what sort of food do you eat, day to day?

Q2. What would you say are the main things that influence what you eat on a day to day basis?

Q3. Are you concerned about your diet at this stage? If yes why?

ALCOHOL

- Level of concern about drinking habits / relevance to health of current drinking habits
- Outcome expectations(both positive and negative) of current drinking patterns, drinking within guidelines and above current guidelines
- Self-efficacy/PBC in controlling/changing alcohol habits
- Any consideration of effect on alcohol on diet – calorific content of alcohol, food choices whilst drinking
- Perceived barriers and actual barriers to reducing alcohol intake
- Beliefs about what might be effective in reducing alcohol intake

Q4. In general, how much alcohol do you drink and in what situations?

Q5. What do you think about the guidelines as to how much you should drink?

PHYSICAL ACTIVITY

- Physical activity behaviour
- Importance and perceived relevance of regular exercise at this stage in life and in the future
- Positive and negative outcome expectations of regular exercise
- Perceived and actual barriers to undertaking regular exercise
- Self-efficacy/PBC in undertaking regular exercise
- What factors may facilitate in undertaking regular exercise

Q6. How physically active would you say you are? What kind of exercise do you do?

Q7. What would you say are the main things that influence how much exercise you do?

Q8. Are you concerned about the amount of exercise you do?

GENERAL

Q9. What do you think are the main things that will influence your eating / exercise / alcohol intake in the future?

Appendix 7.3 Focus group consent form

Consent to participation in a focus group as part of an exploratory study into the perceptions of young people to leading a healthy lifestyle.

Name of Participant: ……

Study: Young People's Perceptions of Leading a Healthy Lifestyle: An Exploratory Study.

Principal Investigators: Dr Catriona Hughes, Dr Amudha Poobalan, Prof W C S Smith

I have read the client information leaflet regarding the above study and have had the opportunity to discuss the details with the researcher on this study, "Young People's Perceptions of Leading a Healthy Lifestyle: An Exploratory Study".

The researcher has explained to me the nature and purpose of the focus group. I understand fully what will happen. I am aware that the focus group will be recorded. I agree to the use of quotations of remarks made by myself in published literature without identification of my details.

I have agreed to take part in the study as it has been outlined to me, but I understand that I am completely free to withdraw from the focus group discussion at any time I wish.

I understand that the focus group is part of a research project designed to promote academic knowledge about healthy living among young people supported by the University of Aberdeen and Grampian Health Board. I am aware that it has been approved by my institution. I am aware that it may be of no benefit to me personally.

I hereby fully and freely consent to participate in the study, which has been fully explained to me.

Signature of Volunteer:…… Date …/…/…

I confirm that I have explained to the volunteer named above, the nature and purpose of the tests to be undertaken.

Signature of Investigator: …… Date …/…/…

Appendix 7.4 Example of initial themes emerging

Concepts or themes either related to behavioural theory constructs or any other themes deemed relevant to the research questions

Aberdeen University 20+ group 25/4/08 1:30:43

facilitator

Just to kick off. First thing just to ask you about is do you think you have a healthy diet? What makes you think you do? What makes you think you don't?

t01

Em, well I seem to be first in this circle. It's never a good thing. Yeah I think so. I tend to eat vegetarian because I can't afford decent meat and I don't like the idea of eating cheap rubbish meat . So, I think when you eat vegetarian and you eat vegetables every day its kind of hard not to be healthy.

t02

Yeah, I think I eat very healthy for similar reasons. I can't really afford good meat. But I try and make sure I get a bit of chicken and fish each week. But I'm not usually that organised about it, but I do try. And you can get really cheap fish at Sainsbury's.

laughter

t02

hint for everybody

t03

Well I'm a vegetarian anyways so doesn't sort of cause that problem. Yeah I think in general I have a healthy diet. mean I like chocolate and cakes, but I just make sure it's not too often. And the same with alcohol, I drink once a week on Friday, but not 5 nights a week getting completely drunk. I don't like the idea of. Well I don't think too much alcohol, it only does damage, so I try to limit all those things.

t04

Yeah, I'm vegetarian too

laughter

t04

and I don't eat wheat products and I don't eat dairy products for health reasons. So I eat a lot of vegetables as well. I try to eat organic vegetables as well. And unfortunately I really like chocolate, especially since I stopped eating wheat and dairy products. And actually yeah. I don't mind. I think that's ok to my diet to eat heaps of chocolate.

t03

so are you allergic to wheat products, or?

t04

I've got a skin disease and I was told that somebody got rid of it by not eating wheat and dairy products, so. That's what I'm trying. And I feel that its helping and for example my digestion is going much better since I quit, much better, it's like hardly comparable.

Appendix 7.5 Coding system for categories or themes –

Recurrent themes that emerged were grouped into categories

1. Knowledge
    - 1.1 Balance
    - 1.2 Consequences of unhealthy lifestyle
    - 1.3 Guidelines for healthy behaviour (e.g.PA, alcohol, 5 a day)
2. Attitudes
3. Behaviour
    - 3.1 Influences on the behaviour
4. Motivators
    - 4.1 Friends
    - 4.2 Partners
    - 4.3 Parents
    - 4.4 Feel good/energetic
    - 4.5 Health
5. Barriers
    - 5.1 Time
    - 5.2 Money
    - 5.3 Access
    - 5.4 Lack of facilities
    - 5.5 Lack of motivation/organisation
6. Intentions
7. Subjective Norm
    - 7.1 Friends and Family
    - 7.2 Cultural
8. Perceived behavioural control
9. Other comments

Appendix 7.6 Example of coding of themes –

Using the developed codes, the transcripts were colour coded and relevant sections highlighted

1. Aberdeen University 20+ group 25/4/08 1:30:43

2. facilitator

3. Just to kick off. First thing just to ask you about is do you think you have a healthy diet? What makes you think you do? What makes you think you don't?

4. t01

5. Em, well I seem to be first in this circle. It's never a good thing. Yeah I think so (3). I tend to eat vegetarian because I can't afford decent meat (6.2) and I don't like the idea of eating cheap rubbish meat.(2) So, I think when you eat vegetarian and you eat vegetables every day its kind of hard not to be healthy. (2)

6. t02

7. Yeah, I think I eat very healthy for similar reasons.(2) I can't really afford good meat. (6.2) But I try and make sure I get a bit of chicken and fish each week. But I'm not usually that organised about it, (6.5) but I do try.(7) And you can get really cheap fish at Sainsbury's.

8. laughter

9. t02

10. hint for everybody

11. t03

12. Well I'm a vegetarian anyways so doesn't sort of cause that problem. Yeah I think in general I have a healthy diet. (3) I mean I like chocolate and cakes, but I just make sure it's not too often. And the same with alcohol, I drink once a week on Friday, but not 5 nights a week getting completely drunk. I don't like the idea of. Well I don't think too much alcohol, it only does damage, so I try to limit all those things. (9)

13. t04

14. Yeah, I'm vegetarian too(3)

15. laughter

16. t04

17. and I don't eat wheat products and I don't eat dairy products for health reasons. (3.1) So I eat a lot of vegetables as well. I try to eat organic vegetables as well. And unfortunately I really like chocolate, especially since I stopped eating wheat and dairy products. And actually yeah. I don't mind. I think that's ok to my diet to eat heaps of chocolate. (2)

18. t03

19. so are you allergic to wheat products, or?

20. t04

21. I've got a skin disease and I was told that somebody got rid of it by not eating wheat and dairy products, so. That's what I'm trying. And I feel that its helping and for

Appendix 7.7 Example of initial charting using individual quotes (For diet behaviour)

University 20+ years old	**DIET BEHAVIOUR**
t01	I think **when you eat vegetarian and you eat vegetables every day it's kind of hard not to be healthy.**
t02	I think **I eat very healthy for similar reasons**. I can't really afford good meat. But I try and make sure I get a bit of chicken and fish each week.
t03	Yeah **I think in general I have a healthy diet.**
t04	**I eat fruits. I eat a lot of nuts** because yeah, just like a handful and I'm happy with it for a couple of hours. There is rye bread which I can eat, um, and I feel it's much better anyway because like I eat one slice and I'm happy for the next couple of hours, whereas toast for example I seriously eat half the packet minimum.
t05	For every animal you don't eat, I eat 3. My diet is based, again **I think it's quite healthy, it's based mostly on vegetables, fruit, meats, nuts.** I seriously limit my grains and dairy products. And so far it's working.
Univeristy 18-19 year olds	
c01	**I try to eat healthily but I can't really control what I eat** in the same way as I do at home (Sweden).
c02	**My diet is awful. I eat like 3 bars of chocolate a day. I always, I always snack now. I never used to snack at all.** Now I'll have, well I have breakfast when I get up early enough to eat it. I tend not to have a lunch. And then I'll have dinner. And like if I have a lunch it'll be Subway or it'll be like a packet of crisps from the shop. **Because when I wake up I never get time to make myself lunch or something**. And I **never have food to be bothered making myself anything.** So I end up eating so much in between meals and stuff, that's like, really not good for me at all. I'll probably still go out now afterwards and get loads of chocolate and eat that.
c04	**Snacking throughout the day because I hardly ever have a proper lunch.** Unless I've made something the night before and think oh I'll make double and take that for lunch tomorrow. **I'll just come down to uni and have like a bag of crisps or I'll get a roll or something. Or just have like 2 snacks throughout the day rather than having a lunch.**
c03	So it's quite easy to not eat healthy unless you plan your lunches and bring them with you. **I only eat one healthy meal a week with proper fresh vegetables in it because it's so expensive.** And then they go out of date really quickly. And normally I try to do a really big shop that lasts me 3 weeks. So I have to use up all the vegetables really quickly. **And I can't afford to then go back into town and do more shopping to get more vegetables. So I just end up having like pizza and chips and stuff.**
c08	The **oldest one she like to cook so she cooks healthy.** She's the only one I guess
College group 1	
v01	it **can be healthy. I go through phases of eating healthy then pigging out,** sort of thing. I try to but it doesn't always work
v02	**can be healthy at times**
v01	**I'd say more healthy than unhealthy**
v01	
College group 2	
m01	I think I'm **very healthy, relatively healthy**. I don't know. I eat a lot of. **All food is organic which is quite healthy I think**. And **then a lot of vegetables and fruit.** I don't really like chocolate or crisps and I don't really go to McDonalds and things. I think it's quite healthy
m02	I don't feel as healthy as m01. **I don't eat as much organic food as she does.** But **I think I eat quite healthy. I avoid eating McDonald's and fast foods. I try to foods well vegetables, meat of course** as well. I think I live quite healthy.

Community group -Mastrick (friends)

p02,p03, p04	**No..I don't have a healthy diet**
p01	**I do.** I've got a healthy diet..I jog every morning
p03	crisps, sweeties. I have like a packet of crisps and a sweetie and like a bottle of irn bru every morning before I start work. **That's not really healthy.**
p02	I'm good. I have cereal in the morning. And then for my dinner I have like a sandwich, a packet of crisps, a bottle of fizzy juice…..I do. **Sometimes I'm good and I have a salad.** But it's pretty extortionate prices. **(p04 Liar)**
p04	**I haven't eaten for 2 days...No. I can't taste nothing. Apart from fags**
p01	**I've not eaten properly in 4 days**
p02	No. Sorry **I've got to have my 3 meals a day**
p03	**I snack in between meals so you're not always hungry**
p02	**see it's hard to snack in between meals if you're working**
p01	when I worked in Primark well **I started 12 till 4, so obviously no breakfast and I only got home for supper**
p04	**it was hard working from 7 in the morning till 10 at night. And only getting a fag every so often**
p03	**I do that (check calories).**.at supermarkets you look at the back of the thingy)
p01	**I'm not a vegetarian but I don't like ham or meat or bacon**
p04	spaghetti hoops. (every one laughs). seem to eat for my supper is rice, macaroni, not all the time though cause gets sickly. **Rice, macaroni, spaghetti hoops or beans on toast**
p02	**rice and , rice and sweet corn, or pasta and sauce**
p04	**3 in the morning**. Chips, cheese, gravy, mayonnaise and tomato sauce
p03	**Do you cook??** just a**, hit and miss really. I dinna cook**. I cook my own meals... but if it's there I'll eat it..... but if it's not then
p02	**Do you cook?? I've got a mother for that**
p01	yeah I do all the cooking and the cleaning in the house. **That's why I don't get up until half past three today. In the afternoon**
p01	well what I eat is.... I don't really know. **Cause of what I am**. £22 **chinese. Right across the road from me, and I got them to home deliver to me yesterday. Across the road from me, literally you can just see it as soon as you go out.** I ate 2 chips out of whole £22 of Chinese. Everyone else just ate it this morning while I was in my bed
p03	**I could live on pizza (p01 agreed)**
p03	**Eating fruit and veg: yes once in a blue moon**
p01	I eat tatties, 5 fruit and veg a day.....if **I've got it then I'll eat it**
p02	**Eating fruit and veg**: **it's got to depend what kind of vegetable it is**
p02	**5 a day: I dinna..I take smoothies. Does that work**
p01	5 a day: **I do, as long as I've got it in the house**
p03	**Eating fruit and veg: I don't eat fruit.**..apart from grapes, that's about it. I don't like anything else **I like veg**
p02	**Eating fruit and veg:I take smoothies**
p04	aye she (mum) buys it **(fruit and veg)**all the time **but I'll only eat it because my ma's got nothing else to eat in the house**
p03	**I'd rather have a packet of quaver**
p01	yeah **I'd rather have a packet of quavers, crisps**
p01	go back to college. **I ate quite a lot of fruit and veg in college for 2 years.** That's more or less what I did eat every day. Breakfast supper and dinner. Everyday
p02	cause I'm away up in Primark and its closer.... No I'm good. **I go to the good food shop or Gregs**

p01	you'll just **never catch me in McDonalds**. There's no way.are you joking. I haven't been... **I just can't stand the smell.** I'll walk in it with someone else. I'll go with them. But no chance you'll catch me taking juice or nothing. Cause McDonalds works like this. **They put too much salt on the food so they'll obviously try to get you to buy more drinks**
p02	**I canna eat MacDonald's..makes me sick**
p04	**(MacDonald's)..their food's shit**

Young Mums Torry

h01	**no,** I don't think it's healthy cause **I eat a lot of takeaways.** Don't really know why.
h03	aye I would say **I'm the same as h01.** I hardly. **Like the same. I like eat chippers and stuff like that**
h01	**Takeaways. Irn Bru is the worst thing I think. I drink about 6 cans a day**
h02	all different stuff..**a lot of takeaways...mm hm**
h03	Rubbish. Just crisps and. Hardly ever, **mind you I had a sandwich today for my dinner, but I hardly, crisps and sweeties and that during the day.**
h03	Aye well they (partners) cook for the kids every night. I hardly ever. **But then I just pick at stuff later on and that. I hardly ever get a proper.** Unless its
h03	**no, hardly ever (eat veg)**, unless I make soup and stuff like that. That's the only time I really buy vegetables and that. Not something that I buy every time I go shopping.
h02	don't eat any vegetables…no...**dinna like them**
h01	**Fitting in 5 a day:** your **cartons of fresh orange juice and that is that not classed as one as well though.** Juices and things...some tomatoes and things. I suppose you could. **Definitely. I suppose some days you would do it without even knowing would you**
h01	**Do you plan?:** not really. X **only ever has the same sort of thing most nights,** either pasta or noodles or. **She's really fussy as well.** But my son, he's still on like jar foods so its fine. Just have heaps of pasta and noodles in and she's fine.

Shire-Youth group

k1	no.. **eat all the wrong stuff...bad stuff (laugh)**
k2	I **wouldn't say healthy ..no... It's all the crap I eat …**
k2	Wrong thing...**I never ever.. eat my vegetables (**sighs) **Dinna.. jus t don't eat them**
k2	**You helped anywhere (making salad). Never..Doesn't bother me**
k2	**If handed vegetables** : **I probably would eat them**
k1	**If handed vegetables:** If you **go to someone's house you feel like eating them but at home.. Nae**

Appendix 7.8 Example of summary of the themes (For diet behaviour)

University 20+ year olds

Diet behaviour: The thought they all ate healthy. Tend to snack more during the stress of exams

Knowledge/Assumptions/Attitudes about healthy diet: All vegetarian/organic food is healthy. Eating fruits and nuts is a healthy diet. Limiting grains and dairy products is healthy. Eating micro waved ready meals/tinned food is unhealthy. It is ok to eat a bit of unhealthy food (fried, lots of mayonnaise) if you have been eating reasonable healthy through the day or have done running around whole day or working hard at studying. As long as it is from raw ingredients then it is healthy.

Reasons for eating vegetarian/organic food: Can't afford good quality meat. Don't feel hungry quickly when eating certain kind of bread (Rye). Don't like eating cheap meat. Supporting the right industry. Belief that animals and fish are treated badly and don't want to be part of that industry (studying conservation biology). Vegetables are cheap but veggie burgers not very cheap (contradiction).

Reasons for eating healthy: It is what they are used to and/or prefer. Feel it is the right thing to do even during times of stress. To feel more fit and better. Unhealthy food makes you sluggish/greasy and horrible while healthy food gives energy for the rest of the day (contradictions). They don't want to risk the chances of getting heart disease but want to expand their life. Don't want to get fat. When you eat unhealthy food suddenly it is not good for the concentration. Eat healthy to look good. For better performance in sports and being healthy.

Influence on behaviour: Mothers made healthy food/ taught about healthy food and they are used to it. Living with friend for a period of time while backpacking who was a healthy eater. How they feel on that day. Taste of food influences what they eat.

Reasons for eating unhealthy (BARRIER): For quick energy during stress of exams/essays. Although healthy food does give quick energy, they get tired of eating healthy food quickly than with unhealthy food. Unhealthy food tastier than healthy food. Unhealthy food keeps them going for a while (contradiction). Not organised with cooking, making sandwiches. Inadequate planning and can't be bothered with cooking. Can't afford to take time out to cook healthy (Contradiction) but some feel cooking a simple meal takes as long a putting pizza in the oven.. Healthy food (meat, fruits and nuts) is expensive.

Eating in phases: Healthy diet tend to break for moment during stressful times and then they go back to healthy food. Same routine (eating local products only /seasonal veg) is hard to keep up.

Reasons for changing to healthy behaviour/Getting back to healthy diet: Being exposed to healthy food by friends when started out independent living. Was not getting fat but felt out of energy, tired and not feeling good. Not a very viable way of living and wanted to get back to the way they were used to at home(eating healthy).

Enjoyment: Need to enjoy food rather than be healthy and skinny.

Balanced diet: Need some fat in diet and need excitement with food, otherwise the whole experience will be difficult to sustain.

Attitude towards Cooking: if they like eating good food, they would love to cook as well bacause you are making something. Hate cooking.

Motivators for healthy eating: It is relaxing to take a break from studying and during times of stress.

Source of information about healthy diet: Parents. Nutrition books from charity shops. Internet searching for healthy diet. Feels there is lot of misinformation in media and internet.

Barrier to healthy diet: Access to healthy food is difficult as it is far away. Healthy food (apple) is more expensive than chocolate bar.

PBC: Like unhealthy food but make sure it is not too often.

Subjective norm: That is what their mothers made and so they prefer that

Concern for future health: Not concerned about future

Expectation from society: Need space at the university to run a food shop. Need for a social space to heat healthy food and opportunity for students to organise themselves to eat healthy.

Influencing other people: Don't really..try but they are set in the ways.

Univeristy 18-19 year

olds

Diet behaviour: Try to eat healthy but can't control. Feel diet is awful with lots of snacking and irregular eating. Try and keep healthy except lunch.

Assumptions/knowledge/ attitudes about diet: They are of the opinion that all snacking is unhealthy. When talk about snacking, it seems to be crisps, chocolates and fizzy drinks. There is a recognition that eating in between meals is not good for them. Only food cooked from fresh ingredients is considered healthy.

Reasons for snacking/irregular eating: Can't be bothered to make lunch and due to lack of time and planning. Snacking increases when skipped a meal.

Reasons for eating unhealthy (BARRIER): Fresh vegetables are expensive and tend to go off quickly as they are big packs. Unless properly planned, it is difficult to cook a proper meal. Meat is expensive. Easy availability of unhealthy food (at your door step) and it looks tasty (contradiction). Lot cheaper to eat unhealthy. Eat unhealthy to save money (contradiction). Sandwiches aren't cheap but convenient. Don't have time to make lunch so eat in between meals. Healthy food is expensive to buy.

Influence on behaviour: Used to eating healthy before coming to university because mums were making meals with fresh ingredients.

Intention to eat healthy: want to eat healthy because it is what they are used to and feel GUILTY to eat unhealthy

Reason for eating Healthy: Feel better and lasts long. It tastes better (contradiction) and feel more satisfied and won't snack. Make them feel in a better mood. Unhealthy food makes them feel sloppy. Have more energy.

Need change: Can't eat something every time just because it is healthy

Feel Guilty: want to eat healthy because it is what they are used to and feel GUILTY to eat unhealthy.

Culturally unhealthy: Food in Britain is unhealthy compared to Sweden.

Attitude to Cooking: It is a hassle: Too much hassle to cook from fresh ingredients even though it is good for you and tasty. Need too many ingredients to make a proper meal. Too much effort. Easy to open a can rather than chop vegetables. Easy to go out and get something than cook. **Feel good :** If you cook, it is better

Expectation from society : Need cheaper health cafes

Access to food: Big shops are far and hard to carry the shopping uphill. There is lack of healthy food as snacks but have plenty of unhealthy food.

Lack of facilities: No kitchen /cooking facilities in halls of residence. Lack of cleanliness when sharing catering with other mates.

Lack of company: don't want to cook for themselves. Would be good to share

Concern about health: Eating unhealthy doesn't bother too much as they don't put on weight. Could be damaging inside. Don't put on weight so no incentive to eat healthy.

College Group 1

Diet behaviour: Can be healthy at times. **Easier to eat veg than fruit** as veg can be added to cooking.

Eating in phases: Tend to eat healthy for a while and pigging out. Healthy eating lasts a week or two but go back

Reasons for eating unhealthy: Just fancy a take away. Something easy rather than preparing. If you don't prepare, then tend to eat out which are mostly unhealthy. Fruits are expensive and don't last very long. Unhealthy food (Packet of crisps) fills up more than an apple and it is cheaper. Unhealthy meals are appetising.

Influence on diet behaviour: Having alcohol and then eating unhealthy food. Spur of a moment decision without thinking.

Reasons for eating healthy: To be healthy and have enough nutrients. Get bad skin if eat rubbish food. Feel disgusting and dirty when eating rubbish food. Visual aspect (look good), heart is healthier, lose weight and look good. Want to get into good habits now.

Reasons for changing to healthy behaviour/Getting back to healthy diet: Get sick of bad food and want to be healthy. When had a takeaway, feel disgusting, dirty and icky and want to eat healthy again.

Expectation from Society: Canteen food is not healthy just quick filling meals.

Influencing other people: Most friends eat reasonably healthy

Cooking: It is an effort. Easier to heat things on hob rather than chop and prepare. Preparing a fruit is harder but want to open a bag.

PBC: Have good intentions but cakes get them and sometimes fancy a take away which is easy rather than preparing. Try to have healthy diet but always doesn't work. Capable of saying 'no' if they had too much unhealthy food even when tried to be persuaded by friends.

Intentions: Have good intentions but cakes get them and sometimes fancy a take away which is easy rather than preparing

Subjective norm: Can be persuaded to get a Takeaway by friends(but don't give in)

Concern about future health : future health is not the first thought.. Concerned more about the looks. Concerned about being anaemic as they don't eat meat.

Assumptions/knowledge/ attitudes about diet: Consider sandwiches from shops are unhealthy. Way you eat does affect later.

Source of information about healthy diet: It is every where... you hear about it.

College Group 2

(living with parents)

Diet behaviour: Relatively healthy because eat organic food

Assumptions/attitudes/knowledge about healthy diet: Eating organic food/fruit and veg is healthy. Aware Chocolate, crisps and McDonalds is unhealthy. Eat crisps..Don't eat everyday still healthy diet. Healthy diet does have an effect later in life.

Eat different: Eat healthy at home but might eat different if lived alone because you might not have money to buy healthy food. Not prepared by parents. Might not be as varied and as healthy but still will eat healthy. Would be too lazy to make healthy food if lived on their own. Might not have time.

Influence on behaviour: How hungry you are (spur of the moment). Just 'in bred' , used to it. Mothers cooking. Feel like having chocolate (mood) never planned.

PBC: When living alone might not be as healthy but will still be reasonably healthy. Feel underweight but would never eat unhealthy to put some more weight on. Friends never lead them astray.

Reasons for eating healthy: Just 'in bred'. used to it all the time. Feel bad when eating unhealthy food..physically not mentally

Reasons for eating unhealthy: Feel like eating unhealthy when you are studying. Healthy options taste bad and boring while unhealthy options tastes good.

Lack of company: Generally don't want to cook for themselves. Feels worth it if you share but some not bothered if need to cook for themselves.

Balanced diet: Eat crisps..Don't eat everyday..so it still is healthy diet

Attitudes towards cooking: Not interested in cooking.

Expectation from society: Food in college is not healthy (have only sandwiches) and it tastes bad. Not cooked well. Have 'Milk bars' in Poland run by students and it is healthy and cheap

Culturally unhealthy: Bread doesn't taste good in Britain. Have milk bars in Poland run by students which is healthy and cheap

Want to be skinny (??eating disorder): Wanted to be skinny when younger but got better.

Reason for changing behaviour: Feel bad if eating unhealthy. Not mentally but physically and so need to change behaviour

Concern about future health: That doesn't really affect.

Community group (Mastrick)

(They were friends)

Diet behaviour: All felt diet was unhealthy except one who jogged every morning. Ate chips, cheese and gravy at 3 in the morning. Had crisps, sweeties, Irn Bru in the morning

Assumptions/ knowledge/attitudes: Aware that having Crisps, sweeties, Irn Bru in the morning is not healthy. Having smoothie is considered 5 a day although not sure of the concept. Aware not getting enough nutrients from diet. Aware that fags are cancer sticks. Not concerned about diet as long as you exercise. Don't like what the family eats. (sausages and gravy). Vodka is tattie/ wine is grapes, cider is apples!

Contradiction: while one was saying that the diet was healthy.. Another said 'liar'

Irregular eating: Don't eat for days. Can't taste anything apart from fags.

Reason for eating irregular: Snack in between meals so don't feel hungry. Long working hours and can only manage a fag in between.

Fussy with food preference: Not vegetarian but don't like meat, ham or bacon. Eat fruit/veg only depending on kind of fruit/ veg. some parents not supportive of the fuss.

Attitudes towards cooking: Don't cook. Got a mother for that. Can't eat the food they cook. Don't like to cook because you won't like it any way.

Reason for eating healthy: Health scare admitted to hospital (binging? Eating disorder)

Reasons for eating unhealthy: Easy accessibility of unhealthy food (Chinese just across the road but ASDA is too far) delivered to the house. Prefer to have pizza and packet of quavers. No support from partner. Stress at work. Can't be bothered waiting in the queue to get fruit and veg. Unhealthy food is cheap.

Eating fruit and veg: eat once in a blue moon... Eat it if it is in the house. Has got nothing else in the house. Only if bothered to going shopping. Have to be in a mood for fruit and veg. Will eat if put on the plate depending on what it is.

Attitude towards Fast foods (MacDonalds): Doesn't like the smell of McDonalds. Makes them sick.. Too much salt on burgers. Like MacDonalds.. Like burger (contradiction). However go there because it is cheap and easily available (closer). Don't go there every day because sick of their food too.

Subjective norm: If doesn't eat what is cooked at home..have to get their own.

Reason for changing behaviour: Ate healthy before met partner but started eating unhealthy with no support. Will change if partner changes his unhealthy diet. Get bored of eating Pizza.

Influence on behaviour: Grand dad who did not eat fruit and veg. Copied him.

Eating disorder?? (same person): Was a binge eater. Didn't eat fruit and veg when younger…followed grand dad. Can't put on weight

Relationship with parents: Take them and keep them. Mum evens cooks separately or them. Haven't seen mum cook for 18 years. Mum has beans but doesn't eat with them.

Concern about health: Worried about boyfriend who eats unhealthy all the time but plays foot ball to burn it but she tends to put on weight. Not worried as you live only once

Source of information about healthy diet: It is all over the place. Mum worked in creche and grew up with knowledge of 5 a day. Check the calories on packets.

Attitude towards others behaviour: Other are skinny but check calories. Doesn't believe in going to gym at 6.30 in the morning. Feeding little children with fruit is good. Observed that her friend has put on weight since her 16th birthday. Mum has some salad which is rubbish.

Media campaign on diet: Heap of rubbish. No one listens to them. Don't pay attention (contradiction). Likes smoking adverts… need a fag when they come on.

PBC: Tried before but partner was not supportive so gave up.

Support from others: If partner helped and joined for dieting, will change.

Eating in phases: Every second day tries salad. Went through a phase of fruit. Keep changing

Young mums (preformed group)

Diet behaviour: Not healthy. Eat lot of takeaways. Like the chippers and stuff like that . Never eat fruit and vegetables apart from using in soups. Some days eat 5 a day without thinking

Eat irregular: Pick at things after kids are fed. Never have a proper meal

Reasons for eating unhealthy: Never buy veg when go shopping. Don't like them (contradiction) Like the taste of fruit and veg but takeaways are easier. Little daughter is fussy. Can't be bothered cooking. Fruit and veg are expensive (contradiction) Irn Bru and sweeties are expensive too but it is available easily. Price doesn't bother them. Not able to cope with looking after the children and cook a healthy meal. Can't stick to healthy diet. Want crisps and sweeties. Don't have time to sit down for a proper meal and then eat crisps. Vegetables go off quickly and can't go shopping to get fresh and so eat available ones.

Attitudes to cooking: Can't cook at the moment. Learning to cook.

PBC: Cant help eating sweeties if they are around in the house. You set out to do then it does not work out. Decide to stop sometimes but then go back to the old ways

Attitudes/ knowledge/assumptions: Setting out to do something does not help (Pressure). Aware it is hard to lose weight when older

Influence on behaviour: Mood you are in. Feeling in yourself. Boredom and eat unhealthy. Siblings go to fast food and you are expected to eat with them. Celebrities in the magazine

Subjective norm: Sisters go to MacDonalds and you are expected to eat with them. Leader says that she would be expected to make soups as the baby grows. When sister who is size 8 says she is fat. ...Makes them feel huge.

Intention: Think should do but never do it. Don't know why.

Eating in phases: Decide to stop sometimes but then go back to the old ways (Takeaways). Don't know why. Get bored of one diet. Go on a diet but can't be bothered with it.

Reasons for eating healthy: Feel better. For looks (daughter says she looks pregnant). Feel better and have lot of energy. Unhealthy makes you feel sluggish

No experience of eating healthy: While some felt makes them feel better some never eaten healthy. not experienced it.

Daughter would try at school but not at home: It is good to expose them to healthy food. She wouldn't eat fish/ veg at home but eats at school.

Support from others: If others ate healthy (siblings) and probably might manage to do it. My boyfriend did it as well so it was easier.

Fussy/ Relationship with parents: Doesn't eat food that mother cooks.

Concerned but still eat unhealthy: Leader feels they are worried about health but still eat unhealthy

Attitude towards others behaviour: They (friends and family) all eat unhealthy.

Concern about health: Ate everything when pregnant (was told) but can't lose weight now. Some are not really concerned.

Community group (Aberdeen shire)

Diet behaviour: Eat unhealthy. Eat all the wrong stuff...fatty. Never ever eat fruit and veg

Eating Fruit and veg: Might eat if handed them. Go to someone else's house but not in their own house. Never shop for fruit and veg. Eats veg in the burgers (lettuce and tomatoes)

Influence on behaviour: Make their own supper and don't make them (veg). Never experienced eating healthy. Friends all eat unhealthy. Work at college restaurant and eats what is available. Never happens (eating fruit and veg)

Reasons for eating healthy: Concerned about being anaemic but will start later.

Intentions: Was told anaemic but have no intention to start eating right away

Reasons for eating unhealthy: money. Eat chips if no money. Laziness. If fat is cut out there is nothing else (not exposed to fruit and veg). No time to cook.. Need money so you work and no time to cook. Weekends are time to sleep and drink ..so no time for cooking.

Motivators for healthy eating: Might eat healthy if can cook. Being anaemic. If become obese.

Knowledge/Assumptions/Attitudes about healthy diet: Aware pasta and salad are healthy. Not sure about health consequences of missing a meal and different kinds of veg. Not worried about being fat. Don't hate vegetables. Tried a veg burger and liked it.

Healthy eating Messages: It is rubbish. Crap. Don't understand. Think about it but don't do it

Intention: No intention to change diet. Might change alcohol. Was told anaemic but have no intention to start eating right away. Have good intention before going to work but not after

Attitude to cooking: will eat healthy if can cook. Want to cook but can't.

PBC: Want to eat healthy until get to MacDonalds. Think about it but don't do it. If I tried confident that could lose some weight.

Concerned about diet/future: sometimes when people around tell that it is not good. Not at all. Never thought of that (health) before.

(motivator) Support from others: Family don't support, banned from cooking. If had support from partner, then will cook more. Sister tried to be healthy but didn't work.

Attitude towards others behaviour: They (friends) all eat unhealthy.

Irregular eating: Don't eat regularly. Skip dinner.

Need change: Can't eat the same thing.

Relationship with parents: don't talk about stuff like cooking

APPENDIX

7.9 Framework analysis for diet behaviour

Appendix 7.9 Framework analysis for diet behaviour

GROUPS→ THEMES↓	*University 20+ year olds* **n=5 (1M/4F), Age range 20-24. Did not know each other. Included two post graduate students**	*Univeristy 18-19 year olds* **n=8 (3M/5F), Age range 18-19. Did not know each other.**	*College group 1* **n=2 (2F), Age range 20-22**	*College group 2* **n=2 (1M/1F), Age range 18-21, friends who knew each other quite well. Staying with their families**	*Aberdeen community group* **n=4 (4F), Age range 18-21, mixture of working and non working, (Mastrick -low SE group), friends, knew each other. Most living with their parents**	*Young mums* **n=3 (3F) Age range 21- 24, preformed community group in Torry (low SE group),Two leaders were present and one of the leaders was the mum of one girl.**	*Aberdeen Shire youth group* **n=2 (1M/1F) Age range 18-19, preformed community group in Aberdeen shire, working (Low SE group)**
1. Diet behaviour	**Actual behaviour:** **All thought they ate healthy** because they ate **vegetarian food** but snacked more/ate unhealthy during stressfull times	**Actual behaviour:** **Try to eat healthy** but can't control. Feel diet is awful with **lots of snacking and irregular eating.** Try and keep healthy except lunch	**Actual behaviour:** Can be **healthy at times.**	**Actual behaviour:** **Relatively healthy** because eat **organic** food/cooked by mothers	**Actual behaviour:** All felt **diet was unhealthy** except one . Ate chips, cheese and gravy at 3 in the morning. Have crisps, sweeties, Irn Bru, MacDonalds. **Irregular eating:** Don't eat for days. Can't taste anything apart from fags	**Actual behaviour:** **Not healthy.** Eat lot of **takeaways/** chippers. **Eat irregular:** Pick at things after kids are fed. Never have a proper meal	**Actual behaviour:** **Eat unhealthy.** Eat all the **wrong stuff**..fatty. **Eat what is available. Irregular eating:** Don't eat regularly. Skip dinner.
	Eating in phases: **Break in healthy diet** during stressful time and then go back. **Same routine is hard to keep up**	**Need a change:** **Can't eat same thing** every time just because it is healthy	**Eating in phases:** Tend to eat healthy **for a while and pigging out.** Healthy eating lasts a week or two but go back		**Eating fruit and veg:** **Eat rarely.** Eat if in the house and got nothing else in house. Only if bothered going shopping. Have to be in a mood to eat fruit and veg . Will eat if put on the plate. **Eating in phases:** Tried salad **every second day .** Went through a **phase of fruit. Keep changing**	**Eating fruit and veg:** **Never** eat fruit and veg apart from using in soups. Some days eat 5 a day without thinking. **Eating in phases:** Decide to stop sometimes but then **go back to the old ways** (takeaways). Don't know why. **Need a change:** **Get bored of one diet.** Go on a diet but **can't be bothered with it.**	**Eating fruit and veg:** **Never** ever eat fruit and veg. Might eat **if handed to** them. Go to someones else's house but not in their own house. **Never shop** for fruit and veg. Make their own supper and **don't make them (veg).** **Need a change:** **Can't eat the same thing.**
2. Influences on diet behaviour	**Positive influences:** **Mothers** made and taught healthy food. **Living with friend who was a healthy** eater. Don't feel hungry soon. **Taste of food:** eat if taste is good. **Healthy food is:** Used to/prefer. Right thing to do. Feel fit and better.Gives lot of energy (contradiction). Don't want to get disease but expand life. Don't want to get fat. Look good. Better performance in sports. **Unhealthy food** sluggish/horrible. Not good for concentration. **Expectations from society:** Need space at the university to run a food shop. Need for a social space to heat healthy food and oppurtunity for students to organise themselves to eat healthy	**Positive influences:** Used to eating healthy before coming to university because **mums** were making meals with fresh ingredients. **Feel better** and and **lasts long.** Healthy food **tastes better** (contradiction). Feel more satisfied and **won't snack.** Make them feel in a **better mood.** Unhealthy food makes them feel sloppy. Have **more energy. Expectations from society:** Need cheaper health cafes	**Positive influences:** To **be healthy** and have enough nutrients. Heart is healthier, **lose weight and look good.** Want to get into **good habits** now. **Get bad skin** if eat rubbish food. Feel **disgusting and dirty** when eating rubbish food. **Expectations from society:** Canteen food is not healthy just quick filling meals.	**Positive influences:** **Mothers cooking.** Just **bred in.**used to it all the time. **Expectations from society:** Food in college is not healthy (have only sandwiches) and it tastes bad. Not cooked well. Have 'Milk bars' in Poland run by students and it is healthy and cheap	**Positive influences:** **Mum** even **cooks seperately for them** if they don't like the food cooked for the family	**Positive influences:** **Celebrities** in the magazine. **Feel better. For looks** (daughter says she looks preganant).Have **lot of energy.** Unhealthy makes you **feel sluggish**	
	Negative influences: **Stress:** snack more during exams.**Quick Energy:** to get energy during exams. **Tired of eating healthy easily** although it gives quick energy. Unhealthy food **is tastier.** Keeps **them going for a while** (contradiction). **Not organised** to make sandwiches. **inadequate planning** and **can't be bothered cooking. Lack of time:** Can't afford to take time to cook but cooking a simple meal takes the same time as oven pizza. (contradiction) Healthy food (apple) is **more expensive** than chocolate bar. **Access to healthy food** is difficult as it is far away	**Negative influences:** Reasons **for snacking/irregular eating** is that they **can't be bothered** to make lunch due to **lack of time** and **planning.** Snacking increases when skipped a meal. Fresh vegetables are **expensive** and tend to **go off quickly.** Unless planned, it is difficult to cook a proper meal. Meat is expensive. **Easy availability of unhealthy food** (at your door step) and **it looks tasty** (contradiction). Healthy food is **expensive** to buy. Eat unhealthy to save money (contradiction). Sandwiches (seen as unhealthy) aren't **cheap but convenient.** Big shops **are far** and hard to carry the shopping uphill. There is **lack of healthy food as snacks** but have plenty of unhealthy food. **Cultural factors:** Food in Britain is unhealthy compared to Sweden. **Lack of company:** Don't want to cook for themselves. Would be good to share. **Lack of facilities:** No kitchen /cooking facilities in halls of residence. Lack of cleanliness when sharing catering with other mates	**Negative influences:** **Having alcohol** and then eating unhealthy food. Something **easy rather than preparing.** If you don't prepare, then tend to eat out which are mostly unhealthy. Fruits are **expensive** and **don't last very long.** Unhealthy food (packet of crisps) **fills up more** than an apple and it is cheaper. Unhealthy meals are **appetising.**	**Negative influences:** **Live on their own** might influence: Eat healthy at home but might eat different if lived alone because you **might not have money** to buy healthy food. **Not prepared by parents.** Might **not be as varied** and as healthy but still will eat healthy. Would be **too lazy** to make healthy food if lived on their own. Might not have **time.** Feel like eating unheathy **when you are studying.** Healthy options **taste bad and boring** while **unhealthy options tastes good. Cultural factors:** Bread **doesn't taste good in Britain.** Have milk bars in Poland run by students which is healthy and cheap. **Lack of company:** Generally don't want to cook for themselves. Feels worth it if you share but some not bothered if need to cook for themselves	**Negative influences:** Reason for **eating irregular** is that they snack in between meals so don't feel hungry. Long working hours. **Fussy with food preference:** Not vegetarian but don't like meat, ham or bacon. Eat fruit/veg only depending on kind of fruit/ veg. **Copied Grand dad** who did not eat fruit and veg. **Easy accesibility of unhealthy food** (Chinese just across the road but ASDA is too far) delivered to the house. **Prefer to have pizza** and packet of quavers. **No support** from partner. **Stress** at work. **Can't be bothered** waiting in the queue to get fruit and veg. Unhealthy food (MacDonalds)**is cheap. Mothers:** If doesn't eat what is cooked at home mum says **have to get their own. "Take them and keep them".** (about mum) **Haven't seen mum cook** for 18 years. **Mum doesn't eat with them**	**Negative influences:** **No experience of eating healthy:** While some felt makes them feel better some never experienced eating healthy. **Never buy veg** when go shopping. **Don't like veg** (contradiction) **Like the taste of fruit and veg.** Takeaways are **easier.** Little daughter is **fussy. Can't be bothered cooking.** Fruit and veg are **expensive** (contradiction) Irn Bru and sweeties are expensive too but it is **avialable easily. Price doens't bother** them. **Not able to cope** with looking after the children and cook a healthy meal. **Can't stick** to healthy diet. Want crisps and sweeties. **Don't have time** to sit down for a proper meal and then eat crisps. **Veg go off quickly** and can't go shopping. **Don't eat food that mother cooks.**	**Negative influences:** **Never shop** for fruit and veg. Make their own supper and **don't make them** (veg). **Never experienced eating healthy. Money:** Eat chips if no money. **Laziness.** If fat is cut out **there is nothing else** (not exposed to fruit and veg). **No time** to cook.. Need money so you work and no time to cook. **Don't talk about stuff** like cooking to **parents** at home
	Values: Reason for eating vegetarian is that they **can't afford quality meat** and don't **like to eat cheap meat. Support right industry.** Veg is **cheaper** but veg burgers not cheap (contradiction). **Mood:** **Feel on** the day. **Assumptions:** **What is healthy diet:** Vegetarian/ organic food/ Fruits and nuts. is healthy. Cooked from raw ingredietns is healthy. Microwaved and tinned food is unhealthy. **OK to eat unhealthy** (lot of mayonnaise, stir fry with oil) if eating reasonably healthy at other times. **Subjective norm:** That is **what their mothers made** and taught and so they prefer that	**Subjective norm:** want to eat healthy because it is what they **are used to**	**Mood:** **Spur of a moment decision** without thinking.Just fancy a take away.	**Mood:** How hungry you are **(spur of the moment).** Depends on **mood and** never planned. **Assumptions:** **Eating organic** food/fruit and veg is healthy		**Mood:** **Mood** you are in. **Way you Feel** in yourself. **Boredom** and eat unhealthy. **Subjective norm:** Siblings go to fast food and you are **expected to eat with them.** Leader says that she would be **expected to make soups** as the baby grows. When sister who is size 8 says she is fat. ...**Makes them feel huge.**	
3. Knowledge/ Sources of knowledge	**Knowledge about diet:** **Parents** cooked healthy meals most of the time. **Nutrition books** from charity shops. **Internet searching** for healthy diet. Feels there is lot of **misinformation** in media and internet. **Influencing others:** **Don't really influence** others. Do try to explain about healthy diet try but are **set in their own ways.**	**Knowledge about diet:** There is a **recognition** that eating in between meals is not good for them	**Knowledge about diet:** Way you eat does **affect later. Info about fruit and veg** is every where... you hear about it. **Influencing others:** Most friends eat reasonably healthy anyway.	**Knowledge about diet:** **Aware** Chocolate, crisps and MacDonalds is unhealthy. Healthy diet does **have an effect later** in life	**Knowledge about diet:** **Aware** that having crisps, sweeties, Irn Bru in the morning is not healthy. **Having smoothie** is considered 5 a day although not sure. **Aware** not getting enough nutrients from diet and fags are cancer sticks. **Info about healthy diet:** It is all over the place. Mum worked in creche and **grew up with knowledge** of 5 a day. **Check the calories** on packets.	**Knowledge about diet:** Aware it is **hard to lose weight** when older	**Knowledge about diet:** Aware **pasta and salad are healthy.** Not sure about health **consequences of missing a meal** and different kinds of veg.

4. Attitudes	**Attitude towards diet:** Need to enjoy food rather than be healthy and skinny. Balanced diet: Need some fat in diet and excitement with food, or whole experience hard to sustain. **Attitude towards cooking:** Pride in cooking : If like eating good food, would love to cook as well because you are making something. Hate cooking. Can't be bothered cooking. **Attitude towards others behaviour:** Friends are not healthy: They never cook from fresh ingredients. Always open cans and use weight watcher products.	**Attitude towards diet:** They are of the opinion that all snacking is unhealthy. When talk about snacking, it seems to be crisps, chocolates and fizzy drinks. Only food cooked from fresh ingredients is considered healthy. **Attitude towards cooking:** Too much hassle to cook from fresh ingredients even though it is good for you and tasty. Need too many ingredients to make a proper meal. Too much effort: Easy to open a can rather than chop vegetables.Easy to go out and get something than cook. Feel good: If you cook, it is better	**Attitude towards diet:** Easier to eat veg than fruit as veg can be added to cooking. Consider sandwiches from shops as unhealthy. **Attitude towards cooking:** It is an effort. Easier to heat things on hob rather than chop and prepare. Preparing a fruit is harder but want to open a bag	**Attitude towards diet:** Balanced diet : Eat crisps..Don't eat everyday so still have healthy diet. **Attitude towards cooking:** Not interested in cooking	**Attitude towards diet:** Not concerned about diet as long as you exercise. Attitude towards fast foods (MacDonalds): Doesn't like the smell of MacDonalds. Like MacDonalds. Like burgers (contradiction). **Attitude towards others behaviour:** Don't like what the family eats. (sausages and gravy). Boy friend thinks that Vodka is tattie/ wine is grapes. Boyfriend eats unhealthy all the time but plays foot ball but she tends to put on weight. Other are skinny but check calories. Doesn't believe in going to gym at 6.30 in the morning like others. Feeding children with fruit is good. Observed that her friend has put on weight since her 16th birthday. Mum has salad which is rubbish. **Attitude towards cooking:** Don't cook. Got a mother for that. Can't eat the food they cook. Don't like to cook because you won't like it any way. **Attitude towards healthy eating messages:** Heap of rubbish. No one listens to them. Don't pay attention (contradiction). Likes smoking adverts... need a fag when they come on.	**Attitude towards cooking:** Can't cook at the moment. learning to cook. **Attitude towards others behaviour:** Daughter would try new food at school but not at home. It is good to expose them to healthy food. They (friends and family) all eat unhealthy.	**Attitude towards diet:** Don't hate vegetables. Tried a veg burger and liked it. Eats veg in the burgers (lettuce and tomatoes) **Attitude towards cooking:** Weekends are time to sleep and drink ..so no time for cooking. Will eat healthy if can cook. Want to cook but can't. **Attitude towards others behaviour:** Friends all eat unhealthy. Sister tried to be healthy but didn't work. **Attitude towards healthy eating messages:** It is rubbish. Crap. Don't understand. Think about it but don't do it
	Concern -diet/future health: Not concerned about future.	**Concern -diet/future health:** Eating unhealthy doesn't bother too much as they don't put on weight. Could be damaging inside. Don't put on weight so no incentive to eat healthy	**Concern -diet/future health:** Future health is not the first thought.. Concerned more about the looks. Concerned about being anaemic as they don't eat meat	**Concern -diet/ future health:** That doesn't really affect.	**Concern -diet/future health:** Worried about putting on weight. Not worried as you live only once.	**Concern -diet/future health:** Concerned but still eat unhealthy: Leader feels they are worried about health but still eat unhealthy. Ate everything when pregnant (was told) but can't lose weight now. Not really concerned.	**Concern -diet/future health:** Concerned about being anaemic but will start later. Not worried about being fat. Sometimes when people around tell that it is not good. Never thought of that (health) before.
5. Changing behaviour	**Reasons for changing behaviour:** Was not getting fat but felt out of energy, tired and not feeling good. Not a viable way of living and wanted to get back to the way they were used to at home(eating healthy). **Motivator to change behaviour:** Being exposed to healthy food by friends when started out independent living. Feeling that it is relaxing to take a break from studying to cook even during times of stress. **Intention and Perceived behavioural control:** Like to eat unhealthy food but make sure it is not too often.	**Reasons for changing behaviour:** Feeling guilty: want to eat healthy because it is what they are used to and feel guilty to eat unhealthy	**Reasons for changing behaviour:** Get sick of bad food and want to be healthy. When had a takeaway, feel disguisting, dirty and icky and want to eat healthy again **Intention and Perceived behavioural control:** Have good intetnions but cakes get them. PBC: Try to have healthy diet but always doesn't work. Capable of saying 'no' if they had too much unhealthy food even when tried to be persuaded by friends	**Reasons for changing behaviour:** Feel bad if eating unhealthy. Not mentally but physically and so need to change behaviour. **Intention and Perceived behavioural control:** When living alone might not be as healthy but will still be reasonably healthy. Feel underweight but would never eat unhealthy to put some more weight on. Friends would never be able to lead them astray	**Reasons for changing behaviour:** Health scare admitted to hospital (binging? Eating disorder). Ate healthy before met partner but started eating unhealthy with no support. Will change if partner changes his unhealthy diet. Get bored of eating Pizza. Don't goto MacDonalds because sick of their food too. **Motivator to change behaviour:** If partner supported and joined for dieting, will change. **Intention and perceived behavioural control:** Tried before but partner was not supportive so gave up.	**Reasons for changing behaviour:** Support from others: If others ate healthy (siblings) and probalby might manage to do it. My boyfriend did it as well so it was easier. **Intention and Perceived behavioural control:** Intention: Think should do but never do it. Don't know why. PBC: Can't help eating sweeties if they are around in the house. You set out to do then it does not work out. Decide to stop sometimes but then go back to the old ways	**Motivator to change behaviour:** Being diagnosed with anaemia. If become obese. Support from others: Family don't support, banned from cooking. If had support from partner then will cook more. **Intention and Perceived behavioural control:** Intentions: Was told anaemic but have no intention to start eating right away. No intention to change diet. Might change alcohol. Have good intention before going to work but not after. PBC: Want to eat healthy until get to MacDonalds. Think about it but don't do it. Confident that could lose some weight if they tried.

APPENDIX

7.10 Framework analysis for physical activity behaviour

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GROUPS→ THEMES↓	*University 20+ year olds* **n=5 (1M/4F), Age range 20-24. Did not know each other. Included two post graduate students.**	*Univeristy 18-19 year olds* **n=8 (3M/5F), Age range 18-19. Did not know each other.**	*College group 1* **n=2 (2F), Age range 20-22**	*College group 2* **n=2 (1M/1F), Age range 18-21, friends who know each other quite well. Staying with their families**	*Aberdeen community group* **n=4 (4F), Age range 18-21, mixture of working and non working, (Mastrick -low SE group), friends, knew each other. Most living with their parents**	*Young mums* **n=3 (3F) Age range 21- 24, preformed community group in Torry (low SE group),Two leaders were present and one of the leaders was the mum of one girl.**	*Aberdeen Shire youth group* **n=2 (1M/1F) Age range 18-19, preformed community group in Aberdeen shire, working (Low SE group)**
1. PA behaviour	**Present PA behaviour:** Wide range from non strenuous walking and jogging to moderate swimming, cycling, playing squash, dancing ,gym to vigorous martial arts and kite surfing	**Present PA behaviour:** Majority walked to places. Few did other sports (rowing and jogging). Few started exercising after coming to University	**Present PA behaviour:** Not very active. Main PA is walking and swimming	**Present PA behaviour:** Very active with cycling, mountain biking, running, basket ball and Gym but less than before	**Present PA behaviour:** Walking to work and back with occasional gym, swimming and dancing	**Present PA behaviour:** Walking and working in the house was the main form of exercise.	**Present PA behaviour:** Walking and activities at 'work' was the main form of exercise.
	Past PA behaviour: Included lot of jogging, cycling	**Past PA behaviour:** Used to do more exercises before coming to Uni. Used to cycle, rugby, swiming, footbal		**Past PA behaviour:** used to be more active with biking, basketball	**Past PA behaviour:** Much more active when younger. Working with kids, dancing, trampolining, gymnastics		**Past PA behaviour:** Used to Play foot ball and go running when younger
2. Influences on PA behaviour	**Positive influences:** Boy friends introducing them to sports. Reasons for exercising were for convenience, save energy/money, enjoy exercising, wanting to be physically able, Feel better after exercising, Wanting to be good at things	**Positive influences:** observing fit parents and joining them for a sport. Reasons for exercising were to have clear mind, save money (walking) and feel better and happy, part of social life	**Positive influences**: Parents cooking good meals and promoting health. To be healthy and feel good	**Positive influences:** Exposure at early age by parents. Enjoy exercising and feel good and relaxed. Exercise as they don't want to feel bad, depressed or grumpy	**Positive influences:** Neccesity was a positive influence due to lift not working. Exercising is fun	**Positive influences:** Mums walk with them. Reasons for exercising to be healthy and keep fit	**Positive influences:** Exercising makes them feel a bit more confident. Feel and look better and happy
	Negative influences: Main reasons were lack of facilities and lack of privacy and confidence. Not having personal equipment to train or go to the gym. Time and cost of gym and sports had negative influence. Can't be bothered and lack of information	**Negative influences:** Reasons for not exercising were Lack of facilities , lack of privacy and confidence,lack of cost and time were major influence. Other factors were bad weather and safety during dark days. Competetive sports was a negative influence	**Negative influences:** Reasons for not exercising were Poor access to facilities, time and cost were the main reasons for not exercising. Can't be bothered/ lack of company was another reason	**Negative influences:** Reasons for not exercising were Stress of exams and time, bad weather, safety. Lack of facilities,lack of company and injury were reasons for not exercising.	**Negative influences:** Reasons for not exercising were Lack of facilities , lack of confidence,lack of cost and time were major influence. Laziness, lack of company and the fact they can't be bothered and injury was also an issue. Parents did not exercise and had a negative influence	**Negative influences:** Reasons for not exercising were Lack of privacy/confidence and weather was a strong negative influence. Responsibilities with children and facilities not condusive to mums with young children was a factor. Cost. Parents did not exercise	**Negative influences:** Reasons for not exercising were Time and injury was important negative influence. Lack of company/facilities and cost was also an issue
	Assumptions: Walking was not considered exercise. Only Gym				**Assumptions:** Assume do enough exercise already	**Assumptions:** Walking not considered as exercise	**Assumptions:** Working at 'work place' not considered as PA
	Preferences to type of exercise/ setting: Do not like jogging in city environment. Prefer doing outdoor sports. Prefer solitary rather than in a group. Gym was convenient. Prefer to eat healthy than exercise	**Preference to type of exercise/ setting:** Preferred walking			**Preference to type of exercise/ setting:** Prefer to do proper exercise (Trampoline) than walking		
	Subjective Norm: Do not do exercise to please anyone or for social constrains but to enjoy	**Subjective Norm:** It is expected of you					
	Values: save energy						
3. Attitudes	**Attitudes towards PA:** Do not exerise for the sake of exercising but to enjoy. Wouldn't pay for Gym when you can do it without any cost	**Attitudes towards PA:** Should have compulsory PE classes in uni like at school		**Attitudes towards PA:** Do not stick to the same. Go through phases with one thing or the other			
	Attitudes towards others PA: Friends need more info on exercise. Seem to be calorie based	**Attitudes towards others PA:** Don't do PA themselves but did not hinder. Not others job to help	**Attitudes towards others PA:** Do PA because of easy access	**Attitudes towards others PA:** Friends need to exercise more. They prefer to be calorie based than exercising	**Attitudes towards others PA:** Mum goes to gym but does not want to take the offer of exercising together		
	Concern -PA/future health: don't tend to think of the future. Aware it is good for health	**Concern -PA/future health:** Do not want to be ill when older. Haven't thought that far into the future			**Concern -PA/future health:** Not worried about exercise	**Concern -PA/future health:** Weight doesn't bother them	**Concern -PA/future health:** Aware of consequences of unhealthy lefestyle. Bothered when alone but doesn't last long
	Attitudes towards PA promotion messages: Not readily available for PA.Empty information that is not useful. Do not focus on the right message						
4. Behaviour change	**Reasons for change in past behaviour:** Levels of activity decreased. Did jogging but have not got trainers. Some started exercise after uni (rowing/walking)	**Reasons for change in past behaviour:** More active in the past. Reasons were lack of company and encouragement from friends. Got into 'Student lifestyle'		**Reasons for change in past behaviour:** Injury was the reason for doing less PA	**Reasons for change in past behaviour:** Don't find time for exercising after the days work. Didn't like people who ran the activity	**Reasons for change in past behaviour:** Got fed up of an activity and gave up all toghter	**Reasons for change in past behaviour:** Don't find time for exercising after the days work
	Motivators to change behaviour: Getting a free bike, publicising clubs and activites at university	**Motivators to change behaviour:** Company and encouragement from friends. Non competetive sports/activites	**Motivators to change behaviour:** Having more time	**Motivators to change behaviour:** Time	**Motivators to change behaviour:** Company, fear of putting on lot of weight, facilities with subsidised cost, support from partners	**Motivators to change behaviour:** Enjoyable activites such as dancing for girls, Goal setting, company	**Motivators to change behaviour:** Company, Discussion with friends
	Intention and PBC: Good intention but never do it. Feel should look after themselves	**Intention and PBC:** will start exercising more after exams		**Intention and PBC:** Talk a lot about it. But doesn't turn to action	**Intention and PBC:** Intend to do with partner but not sure if it will happen	**Intention and PBC:** Think about it but don't have the motivation to do it	**Intention and PBC:** New year resolution to eat better, do more exercise.
5. Knowledge	**Knowledge about PA:** Feel they lack knowledge about types of exercise and their benefits	**Knowledge about PA:** Aware they need to exercise to get around and be independent later in life.					**Knowledge about PA:** Would get massive if didn't exercise
				Influening others behaviour: Tried to make them use stairs but does not work	**Influening others behaviour:** Tried to influence friends for swimming but was not successful		

APPENDIX 8

8.1 Analysis of the UK recommendations on obesity based on a proposed implementation framework. [Review] [37 refs]. ***BMC Public Health 2010***

8.2 Effects of weight loss in overweight/obese individuals and long-term lipid outcomes: a systematic review. [Review] [21 refs]. ***Obesity Reviews 2004***

8.3 Weight loss interventions in young people (18 to 25 year olds): a systematic review. [Review] [44 refs]. ***Obesity Reviews 2009***

8.4 Bias in self-reported heights and weights: the impact on BMI in surveys in adolescents and young adults. (Abstract). Presented at the European Congress of Obesity. ***Obesity Facts 2009***

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RESEARCH ARTICLE Open Access

Analysis of the UK recommendations on obesity based on a proposed implementation framework

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Abstract

Background: There is considerable expertise in the obesity field in identifying, appraising, and synthesising evidence to develop guidelines and recommendations for policy and practice. The recommendations, while based on evidence, are not formulated in a way that readily leads to implementation. This paper analyses the recent UK recommendations on obesity using a proposed implementation framework.

Methods: Two bibliographic databases (Medline and Embase) and various health related and government websites were systematically searched for obesity recommendations published between 1996 and 2007. All the documents published on recommendations for either prevention or treatment of obesity in the UK were assessed. A proposed implementation framework was developed for the purpose of this review. All the UK recommendations were critically appraised and results summarised according to the criteria used within the framework. Cross-country applicability of the proposed framework was assessed using the Swedish policy recommendations on obesity.

Results: Most recommendations on obesity while demonstrating their basis in evidence, fail to meet the implementation standards. They tend to be non-specific in identifying who is responsible for implementation and monitoring, and often no timescale is indicated. The costs of implementation are rarely estimated and those responsible for such funding are not specified. There are some notable exemptions to the general pattern emanating from more operational and locally based groups. The Swedish policy details 79 proposals with responsibility clearly identified and costs are presented for 20 of them. This policy satisfied most of the framework criteria but failed to give details on evaluation, monitoring and the timeframe for implementation.

Conclusions: Public health has developed skills in appraising evidence and formulating recommendations based on appropriate evidence but these are often not implemented. Different skills are required to translate these recommendations into actions. Public health clearly needs to develop the implementation skills to a level comparable to the ability to synthesise evidence.

Background

The UK adult overweight/obesity prevalence has increased steadily in the past three decades [1-3], despite targets set by the government [4] to reduce obesity levels. A review conducted by National Audit Office (NAO) in 1996 [5] showed no evidence of reduction. The Health Survey for England [6] in 2005 reported two thirds of adults and a third of children as overweight/obese. The recent obesity Foresight document [7] suggests that if current trends continue that by 2015, 36% of males and 28% of females will be obese, increasing to 60% and 50% respectively by 2050. This increase in obesity has consequences for individuals with increased risk of co-morbidities and costs, and for society with the current total cost (including NHS) at £7 billion rising to £50 billion per year by 2050 [7].

Systematic reviews and reviews of reviews [8] have investigated the evidence on prevention and treatment of obesity. These give various recommendations from which policies and strategies have been published with the common aim to reduce the rise in obesity. The aim of this assessment is to critically appraise all published UK obesity recommendations (1996-2007) for implementation criteria using a proposed implementation framework. An additional aim is to assess the cross-

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country applicability of the developed framework using the Swedish action plan for healthy dietary habits and increased physical activity [9]. This document has been identified as one of the most detailed documents on obesity policies [10] and provides an opportunity to evaluate the framework.

Methods

An initial scoping exercise was conducted to identify any implementation framework to assess guidelines on obesity. One framework was identified for monitoring and evaluating implementation of the global strategy on diet, physical activity and health published by the WHO in 2008 [11]. This framework suggested that process, outcome and output indicators should be identified by each member state. The literature was also searched for recurrent themes within various recommendations that were relevant to implementation. The proposed framework with critical items was developed based on these recurrent common themes which were: specificity of the target population, responsibility for implementation, monitoring, evaluation, time frame, priorities and cost estimation.

The electronic bibliographic databases, Medline and Embase, were then systematically searched for articles published from 1996 to December 2007. Mesh terms and key words for 'obesity', 'obesity guidelines', 'recommendations' were combined using Boolean operators to identify the relevant articles and reports. The search strategy used in Medline is detailed in the additional file, which was modified for use in Embase (see Additional file 1). A structured search of the internet was undertaken to identify the other guidelines and recommendations not indexed in the electronic bibliographic databases. The sources accessed were Science Direct, Blackwell Synergy, National Electronic Library for Health (Guidelines Finder), University of York Centre for Reviews and Dissemination, Public Health Electronic Library, The National Electronic Library for Health, Scottish Intercollegiate Guidelines Network (SIGN), The National Institute of Clinical Excellence (NICE), Health Development Agency (HDA), Department of Health (DoH), and The Stationery Office site. The key words used for the website searches were 'obesity', 'guidelines' and 'recommendations'. All the identified abstracts were scanned by two reviewers and full texts of potentially eligible documents were obtained and assessed according to the inclusion criteria.

All the included UK recommendations were appraised using the proposed framework. The relevant details were extracted from all the documents included. The assessment of the obesity recommendation documents are summarised according to this framework. The Swedish action plan for healthy dietary habits and increased physical activity [9,10] was critically appraised using the same criteria to assess the cross-country applicability of the developed framework.

Results

The systematic search identified 4275 abstracts, of which 133 were potentially eligible. The full texts of these were critically appraised and 21 articles were included in the review. The results of the literature search and the selection process are presented in Figure 1.

Key recommendations for obesity identified in selected UK reports

The reports identified key nutritional recommendations. These were to replace energy dense snacks and drinks with healthier alternatives from vending machines in school and fast food outlets [12-14]; to train teachers in healthy food advice and physical activity [12]; to shift consumer demand from high fat, high calorie diets to healthier alternatives [12,15] with the Government and Food Standard Agency (FSA) working together; to simplify food labelling for easy interpretation by the general population [16]; to ban marketing of unhealthy foods targeting children [17,18]; and to provide healthy diet and physical activity advice to pregnant and/or breast feeding women to promote weight control [14,15].

The reports identified key recommendations for physical activity. These were that schools and local authorities should improve physical activity levels by allocating ≥ 3 hours per week for physical activity among school children; make safer pedestrian routes [12-14]; provide information about pedometers for all age groups [12,14] and to consider single sex physical education classes to improve participation of girls and ethnic minority groups [12-14].

The recommendations for obesity management were that physicians should maintain databases for patients at risk of developing obesity [19] and for those receiving obesity treatment (drugs and surgery) [20-22]; that the Government should provide sufficient funds for the NHS for at least one specialist primary care obesity clinic within each Primary Care Trust area and to expand obesity services in secondary care to include bariatric surgery for morbidly obese people [12,23]; that easy access to specialist treatment for obese children and young people should be provided [24] and funds should be made available for doctors and nurses to train in obesity management [15,23].

These reports recommended that the Government should initiate a health education campaign specifically for tackling obesity [12,15]. Guidelines for drugs and obesity management should be constantly evaluated [25] with information about effectiveness of obesity treatment and preventative interventions being disseminated to appropriate health care professionals [26].

Analysis of UK obesity recommendations using the Implementation Framework

The 21 selected reports were analysed using the proposed implementation framework based on 7 criteria (see Additional file 2). The findings are summarized in Table 1. All 21 studies [12-32] clearly define the target population and prioritise in terms of either prevention and/or treatment. Sub-groups of the community vulnerable to obesity are specifically targeted within recommendations. The organisations responsible for implementation [12-26,28-32] was considered by 20 of the studies. The Government, Department of Health, Cabinet Task Force, NHS and physicians were identified as having responsibility for monitoring of implementation, but 5 out of the 21 articles did not report on how the implementation progress should be monitored or evaluated. Achieving set milestones, conducting regular audits and maintaining databases on progress were tools suggested for monitoring and evaluating the progress of implementation. Although stated, there was no evidence of ownership of these published recommendations.

Only four reports considered an implementation timeframe [13,14,23,31]. The report by the Faculty of Public Health [13] set the time for achieving targets to be

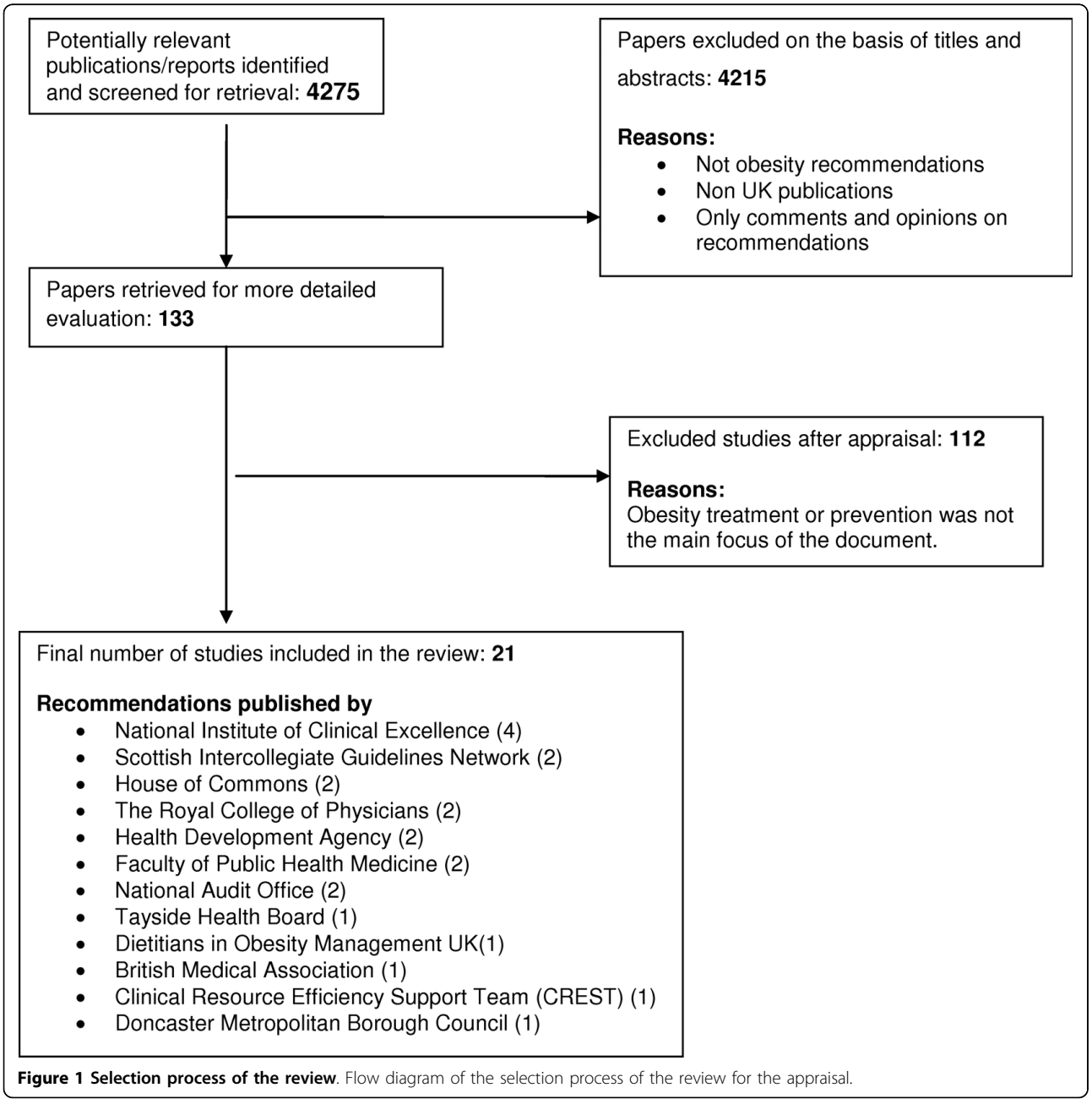

Figure 1 Selection process of the review. Flow diagram of the selection process of the review for the appraisal.

Table 1 Results of the analysis of recommendations. Analysis of essential elements within the recommendations using the Implementation framework

Implementation framework elements	Number out of 21 set of recommendations	Details
Target population	21 out of 21 14 = Both adults and children; [12-16,19,23,25-29,31,32] 4 = Children and young adults (up to 18 years) only;[17,18,24,30] 3 = Obese adults [20-22]	Children and adults, obese adults, children of obese parents and with a family history, people with diabetes and coronary heart disease, low income groups, pregnant women, smokers, disabled people and ethnic groups
Responsible agency	20 out of 21[12-26,28-32]	Government, Department of Health for overall development and implementation of strategies NHS for management within NHS and training of GPs and nurses GPs for implementation of clinical guidelines and maintaining the audit for compliance Local authorities for local implementation of recommendations (i.e safe routes) Food Standard Agency for Nutrition Department of Sports, Sports England and Sports Scotland for Physical activity
Monitoring and Evaluation	16 out of 21 [12-16,19-23,25,26,28,30-32]	One third of the articles did not report on how the implementation progress would be monitored or evaluated. The Government, Department of Health, cabinet task force, NHS and physicians were implied for the monitoring of implementation. Achieving the set milestones, conducting regular audits and maintaining databases on progress were few of the tools suggested for monitoring progress of implementation.
Time-frame for the implementation	4 out of 21[13,14,23,31]	Very few set out specific time-frame for implementation. Two studies[12,24] stressed implementation was urgent and some studies anticipated problems in implementing the recommendations
Prioritisation	21 out of 21 4 had treatment as priority [20-23] 2 had treatment and prevention [27,32] 15 had prevention only as priority [12-19,24-26,28-31]	Although the recommendations was separated out broadly into 'Treatment' and 'Prevention', in many there was a long list of recommendations without any priority for specific components
Cost and resources	7 out of 21[14,20-23,28,32]	Seven studies estimated the costs to the NHS for implementation of their recommendations. 11 did not mention cost or funding and the rest only recognised cost as an issue for successful implementation

within 3 years of their report with goals set for the 1st, 2nd and 3rd year whereas the Tayside report [14] set a 10 year timeframe with goals set at the 1st and 5th year. The other two reports mentioning timeframes gave no details. Two reports by NICE [20,21] predicted the uncertainty in implementation due to lack of expertise and resources plus training of doctors. Two other reports [12,24] merely stated that the implementation of recommendations was urgent.

Seven reports gave estimated implementation costs [14,20-23,28,32]. NICE gave NHS estimated costs for orlistat, sibutramine and bariatric surgery recommendations [15-17]. The Tayside local strategy for obesity report [14] gave costing for the extension of their weight management service to all Tayside GP practices, child obesity services and their food "dudes" programme [14]. One report [28] identified resources along with skills required for interventions. Of the remaining, eleven gave no costing, two others [13,19] suggested that their recommendations should be implemented after considering the available resources and the "Toolkit for obesity" by the Public Health Faculty [31] recommended that the NICE costing templates [32] for adult and childhood obesity management should be used.

Cross-country applicability of the developed framework

The Swedish action plan [9] has been identified as one of the most detailed documents [10] addressing obesity as part of the action plan for healthy dietary habits and increased physical activity. It has 79 proposals (called measures) in 12 specified policy areas (see Additional file 3) with detailed descriptions of the justification for each measure. It clearly identifies the people responsible for implementing all the 79 proposals highlighted. Only 20 out of the 79 proposals gave cost estimates, with one proposal indicating the split between development and implementation. However, the action plan did not provide adequate information in terms of monitoring, evaluation and time frames. Some of the proposals highlight the importance of evaluation but details of how this might be achieved or who would be responsible for the evaluation was not clear. The breakdown of the costing in 4 of the proposals gave an indication of time frame (e.g. EUR 8.5 million over 7 yr period or EUR 210.000 per year for 3 years and EUR 53.000 per

year for 5 years), but was otherwise not clearly stated. Within the proposals, gaps and limitations which need to be addressed were identified, for example the lack of health information to ethnic minorities, lack of evaluation of organisational measures, and shortage of intervention research in Sweden.

Discussion

Main findings of this review

This critical appraisal of obesity prevention/treatment recommendations in the UK using implementation criteria indicates that some aspects such as priorities and target populations are generally well laid out. However, important factors such as timeframes and cost estimations are not adequately addressed. The responsible organisations are often identified but actual ownership of the recommendations is unclear. Treatment recommendations for drugs and surgery were more specific with projections of cost and future eligible populations. However, prevention recommendations tended to lack clarity for timeframes and costings.

What is known and what this review adds

There is considerable expertise in the process of identifying, critically appraising, and synthesising the evidence to develop guidelines and recommendations for obesity policy and practice. However, there are indications that these recommendations are failing to be implemented despite being evidence based, which may be due to their formulation and presentation.

This assessment is the first to systematically appraise recommendations for obesity treatment/prevention in terms of the criteria for their implementation. All the recommendations within UK and one action plan from Sweden were appraised using an implementation framework. Another framework recently proposed by Sacks *et al* [33] has analysis grids for a comprehensive policy approach to reducing obesity hence identify areas for obesity policy action. Our review leads on from this by proposing criteria within such policies to be addressed for easier implementation.

Recommendations need to be framed in a manner to facilitate their implementation and this includes targeting, ownership, monitoring and evaluation, time frame and resource implications. This approach is generalisable and can be used to assess other strategy documents and their recommendations. It is worth noting that evidence based guidelines/action plans do not always give the essential elements for implementation at the initial stage but may be extended as formal implementation plans at a later date.

The NHS Modernisation Agency [34] with 24 Primary Care Trusts (PCTs) conducted a review to identify obesity strategies developed by the Trusts as a response to recommendations issued by the Faculty of Public Health [13]. This review found that the Trusts were at the early stages of development and implementation, and highlighted the evidence of current best practices by various Trusts. Since this review, two strategies have been published in England [35] and Scotland [36] which move away from focusing on the individual and instead consider broader holistic integrated approaches to obesity prevention such as healthy lifestyle adoption at all levels of society, but these still do not address the issues if implementation highlighted in this paper. The Swedish action plan identified as one of the most complete documents [9] provides detailed descriptions of 79 proposals and addresses most of the criteria identified in this framework but it does not address the issues of monitoring, evaluation or the setting of time frames. The essential elements identified in this proposed framework encompass issues at the level of recommendation/guideline formation that will facilitate implementation. Successful implementation of guidelines (in whole or in part) will result in various interventions being developed which can be assessed using a Health Impact Assessment [37] which reflects some of the broader issues covered by the proposed framework.

The literature search used a comprehensive strategy but many of the recommendation documents were not electronically indexed in databases and available only on websites. Efforts were made to identify all documents from various sources but recommendations by various groups, charities and local authorities may not be readily in the public domain.

The implementation framework was developed through a scoping exercise and was based on the recurring themes within guidelines and may require modification in light of experience with its use. The proposed framework thus provides a first step in assessing the obesity guidelines to emphasise the importance of addressing the essential elements contained within them for successful implementation.

Conclusion

Obesity recommendations in UK clearly define the target population and are well prioritized in terms of either prevention and/or treatment. Sub-groups of the community vulnerable to obesity are specifically targeted within recommendations with most identifying the organisations responsible for implementation. However, for recommendations to be successfully implemented, it is essential that they also have clear timeframes, costings and identify ownership, training and coordination within local organisations. Clinicians and academics involved in producing recommendations and policies should consult public health professionals who are more familiar with actual implementation of the proposed actions to ensure that their proposals are realistic for successful

implementation. The proposed framework could be used as a basis and adapted for wider use in other countries, for other topics and for different target groups. Every effort should be taken to formulate evidence based recommendations that facilitate their effective implementation in view of the rapidly increasing obesity epidemic.

Additional file 1: Search Strategy. Search Strategy used in Medline which was modified for the other databases.
Click here for file
[http://www.biomedcentral.com/content/supplementary/1471-2458-10-17-S1.DOC]

Additional file 2: Analysis based on proposed framework. Analysis of articles on obesity recommendations based on the proposed implementation framework.
Click here for file
[http://www.biomedcentral.com/content/supplementary/1471-2458-10-17-S2.DOC]

Additional file 3: Cross-country applicability of the proposed framework. Analysis of the Swedish Action Plan based on the proposed framework.
Click here for file
[http://www.biomedcentral.com/content/supplementary/1471-2458-10-17-S3.DOC]

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Authors' contributions
The study was designed and planned by WCS. AP and SA carried out the systematic review. LA, AP and WCS contributed to the development of the implementation framework. AP and SA drafted the manuscript with the contribution from all authors. All authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

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Effects of weight loss in overweight/obese individuals and long-term lipid outcomes – a systematic review

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Summary

This paper aims to review the evidence for long-term effectiveness of weight loss on cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL) and triglycerides in overweight/obese people. Current evidence is mostly based on short-term studies. A systematic review of long-term lipid outcomes of weight loss in studies published between 1966 and 2001, was conducted. Inclusion criteria included all cohort studies and trials carried out on participants with body mass index of greater than or equal to 28 kg m^{-2}. Studies had at least two weight change measurements and follow-up of more than 2 years. Thirteen long-term studies with a follow-up of more than 2 years were included. Cholesterol has a significant positive linear relationship with weight change ($r = 0.89$) where change in weight explains about 80% of the cholesterol difference variation (Adj $R^2 = 0.80$). For every 10 kg weight loss a drop of 0.23 mmol L^{-1} in cholesterol may be expected for a person suffering from obesity or are grossly overweight. Weight loss has long-term beneficial effects especially on LDL and cholesterol. Weight loss in obese patients should be encouraged and sustained.

Keywords: Cholesterol, lipids, long-term (>2 years), weight loss

obesity reviews (2004) **5**, 43–50

Introduction

Obesity is a chronic medical problem affecting an increasing number of people worldwide to the extent that it is now recognized as a global epidemic. In the last 15 years the USA has seen an alarming rise in obesity, with one-third of the population now affected by it (1). This has been followed by similar trends in Europe.

Obesity induces multiple metabolic abnormalities that contribute to the pathogenesis of diabetes mellitus and cardiovascular disease, and is associated with increased morbidity and mortality risk (2). The Framingham Heart Study showed increased cardiovascular disease, particularly coronary heart disease (CHD), in overweight men and women (3). Although prevention of obesity would obviously be the long-term solution to this therapeutic challenge to clinicians, this does not address the imminent risks for those already obese. Many now believe that, particularly for the morbidly obese, it is unrealistic to expect weight losses that reduce an individual to the 'normal' weight category. Instead, health clinicians now encourage any weight loss. It is hoped that such weight loss will be more achievable and maintainable and will still have benefits with respect to related health outcomes.

The primary concern in the medical management of obesity is to decrease the risk of morbidity and mortality by reducing the underlying cardiovascular and metabolic risk factors, such as atherogenic dyslipidaemia. Previous reviews of intentional weight loss studies have reported that moderate weight losses (losses of 5–10%) are associated with significant improvements in obesity-related cardiovascular and metabolic abnormalities (4,5). However, the primary studies included in these reviews have either small sample sizes or relatively short-time follow-up. There

is a lack of evidence regarding long-term benefits of weight loss on lipids.

The aim of this paper is to systematically review the extent to which weight loss affects levels of total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL) and triglycerides, in the long term, for grossly overweight/obese people.

Materials and methods

As part of a Health Technology Assessment (HTA) review (6), a systematic search of literature was undertaken to evaluate the long-term effects of weight loss on levels of total cholesterol, HDL, LDL and triglycerides in those with obesity. The search was undertaken on Medline, Embase, Cinahl and HealthSTAR bibliographic databases. The review included literature published between 1966 and 2000 with no language restrictions.

The inclusion criteria covered all prospective studies and trials carried out on participants with body mass index (BMI) of greater than, or equal to, 28 kg m^{-2}. Studies with BMIs of 28 were included because overweight people on the verge of obesity may also experience some of the hazards of obesity. Consequently, future reference of obese people in this paper also refers to those grossly overweight as well as those suffering from obesity. The criteria also included studies with weight change measurements and a follow-up of more than 5 years. However, in the case of non-surgical interventions, follow-up was reduced to 2 years because of the paucity of long-term studies. The criteria for surgical intervention studies remained at 5 years.

Participant criteria included adults between 18 and 70 years. After 70 years of age weight loss may be confounded with age, hence this age group and older, were excluded. Studies on Caucasian, Afro-American, Japanese American and British Asian populations were included in the review. It should be noted, however, that the ethnic minorities in Western cultures may have adopted the culture and dietary habits of their Caucasian counterparts and may therefore have similar risks of obesity. Randomized controlled trials (RCTs) with follow-up of 2 or more years fitting our other criteria were included in the review. Animal studies and studies with less than 40% follow-up were excluded.

Search strategies were developed for the selected bibliographic databases. For relevant studies, abstracts were divided up and read by two independent reviewers. Full articles of the studies that met our selection criteria were obtained, and initially assessed by two independent reviewers and then by one reviewer for methodological quality using an adopted form. Reference lists of all studies and review articles included were also checked to identify other relevant studies. A data extraction form was designed, piloted and amended before being used by two independent reviewers to extract the data from the papers. Researchers consulted regularly with each other to discuss any inclusion queries as they arose. Where relevant and possible, authors were contacted for further information about studies not available from their published papers.

Statistical methods

Our aim was to investigate how weight differences relate to differences in lipid levels in the long term. Weight differences and lipid measurement differences were considered for significance, that is, compared to their respective baselines.

Several papers did not provide mean differences per se, giving only the mean of each variable at each time point with some measure of spread about those means. The differences of these means acted as estimates of the mean differences, albeit crudely, because the sample sizes were not always the same at the beginning and end of studies. In these cases, a measure of variation was also needed and estimated as detailed in the next section.

Methods of estimating measures of variation

Methods of estimating standard deviations have been developed for each variable by investigating the relationship between observed means of differences and associated standard deviations. Models based on more than 30 RCTs independent of this review showed simple relationships between mean differences and their observed standard deviations. These models were based on shorter-term RCT studies (6). Similar models were developed on our relatively few longer-term studies, giving results comparable to the shorter-termed RCTs. Our observations based on both short term and long term indicated that the variation was fairly constant for the lipid means unlike the weight change where the variation increases as the weight change increases in a linear fashion. Consequently, for those studies with no actual mean differences these were estimated by the difference between the observed follow-up mean and the associated baseline mean. Their respective standard deviations were estimated using either the short-term RCT results or the long-term results (depending on which was the most conservative estimate) as shown in Table 1.

Regression analysis of weight and lipid differences

Correlation and linear regression, to predict differences in each of the lipid outcomes from the associated weight differences, were conducted. Meta regression is an appropriate analysis because, for each subgroup within each study, only the mean differences of both the weight change and lipid outcomes are available (or estimable) rather than the differences for all individuals. The use of

Table 1 Standard deviation estimates based on RCT* studies adjusted for long-term studies. Standard errors of mean differences SE = SD/√n

Outcome differences	SD estimates RCTs*	SD conservative estimates adjusted for long-term studies
Weight	(s† = 41, R^2adj = 0.537). Wt diff SD = 5.915 + 0.283 × (abs wt diff)	(s = 25‡, R^2 adj = 0.729). Wt diff SD = 5.837 + 0.319 × (abs wt diff)
Cholesterol	s = 44 constant at 1.08 mmol L^{-1}	s = 10 constant at 1.08 mmol L^{-1}
Triglycerides	s = 42 constant at 0.96 mmol L^{-1}	s = 6 constant at 1.53 mmol L^{-1}
LDL	s = 30 constant at 0.74 mmol L^{-1}	s = 4 constant at 0.74 mmol L^{-1}
HDL	s = 42 constant at 0.29 mmol L^{-1}	s = 10 constant at 0.29 mmol L^{-1}

*Acknowledgement to Magnus Magee, HSRU, Medical School, University of Aberdeen [Appendix M, HTA review (6)].
†s represents the number of studies that had both mean differences and their respective SD values.
‡Estimated from the present studies and others available to authors.
Wt diff SD, weight difference standard deviation; abs wt diff, absolute weight difference; RCT, randomized controlled trial; LDL, low-density lipoprotein; HDL, high-density lipoprotein.

Table 2 Basic characteristics of included studies

Author	Year	Country	Sample size	Type of			Follow-up percentage
				Study	Intervention	Time	
Wing *et al.* (8)	1995	USA	202	RCT – retrospectively grouped into weight cycling categories	Diet + behaviour	30 months	76%
Kauffmann *et al.* (9)	1992	Spain	104	Prospective study in a work place	Workplace (diet + exercise advice)	2 years	77%
Ewbank *et al.* (10)	1995	UK	45	Prospective – retrospectively grouped into tertiles of levels of exercise	Diet, behaviour mod & exercise	2 years	82% completers, 78% full results
Sjostrom *et al.* (11)	1999	Sweden	1827	Prospective clinical study	4 weeks residential diet & exercise	5 years	28% men, 31% women*
Wing *et al.* (12)	1998	USA	154	RCT	Diet and exercise	2 years	between 78–95%
Hauptman *et al.* (1)	2000	USA	635	RCT – drug	Orlistat	2 years	between 43–56%
Davidson *et al.* (2)	1999	USA	892	RCT – drug	Orlistat	2 years	45% over all groups
Teupe & Bergis (13)	1991	Germany	100	RCT – drug	Metformin	2 years	between 50–58%
O'Leary (18)	1980	USA	274	Prospective – surgical	Jejuno-ileal gastric bypass	≥ 5 years	Not specified
Hess & Hess (14)	1998	USA	440	Prospective – surgical	Bilio-pan bypass	8 years	21%, at 5 years n = 92
Gleysteen (15)	1992	USA	43	Prospective – surgical	Roux-en-y bypass	5–7 years	77%
Rossner & Hallberg (16)	1980	Sweden	29	Prospective – surgical	Jujuno ileal bypass	3.6 years	80% men, 53% women
Karason *et al.* (17)	1999	Sweden	20	Prospective – surgical	Gastroplasty and diet	4 years	92%

*Only 11 men and 24 women have high-density lipoprotein 5-year base comparisons!
RCT, randomized controlled trial.

weighted least squares regression is a method suggested by Sutton *et al.* (7) as a way of combining such means of studies. The weights are defined as the inverse of the standard errors of the mean differences of the dependent variable, in this case each of the lipid outcomes. The SPSS algorithm used here to conduct the weighted least squares regression, routinely optimizes the solution raising these weights to a power, ranging from –2 to 2 depending on which maximizes the log likelihood function. However, the precision of the regression coefficients generated from such a model requires further adjustment by hand for meta regression to determine significance of the coefficients (7).

Results

A total of 7567 abstracts were scanned, and 288 full articles were obtained and critically appraised of which 13 studies investigated the effects of weight loss on lipids. The basic characteristics of these 13 studies included are detailed in Table 2. The lipid results are considered by interventions – non-surgical (Table 3) and surgical (Table 4). Non-surgical interventions are further subdivided according to study type, weight cyclers, prospective cohort studies and RCTs. The results are recorded as mean differences with standard errors (those that were estimated being represented in bold).

Table 3 Results of non-surgical weight intervention studies on the effects of weight loss on lipids

Study	*n*	Wt diff (kg)	(SE)	*n*	Cholest diff (mmol L^{-1})	(SE)	*n*	Tg diff (mmol L^{-1})	(SE)	*n*	LDL diff mmol L^{-1}	(SE)	*n*	HDL diff mmol L^{-1}	(SE)
Non-surgical weight cyclers†															
Wing *et al.* (1995) (8)															
Gainers	15	10.30*	**(2.36)**	15	0.33	**(0.28)**	15	0.93*	**(0.40)**	15	–0.04	**(0.19)**	15	–0.06	**(0.07)**
Stable	25	3.00*	**(1.36)**	25	0.14	**(0.22)**	25	0.18	**(0.31)**	25	0.05	**(0.15)**	25	0.00	**(0.06)**
Large cyclers	31	–2.10	**(1.17)**	31	–0.34	**(0.19)**	31	–0.01	**(0.27)**	31	–0.29*	**(0.13)**	31	–0.01	**(0.05)**
Small cyclers	28	–2.60	**(1.26)**	28	0.11	**(0.20)**	28	0.33	**(0.29)**	28	0.02	**(0.14)**	28	–0.07	**(0.06)**
Partial cyclers	28	–9.70*	**(1.69)**	28	–0.4	**(0.20)**	28	–0.38	**(0.29)**	28	–0.34*	**(0.14)**	28	0.10	**(0.06)**
Small success	7	–5.90	**(2.92)**	7	0.11	**(0.41)**	7	–0.10	**(0.58)**	7	–0.01	**(0.28)**	7	0.17	**(0.11)**
Large success	14	–12.60*	**(2.63)**	14	–0.23	**(0.29)**	14	–0.29	**(0.41)**	14	–0.2	**(0.18)**	14	0.09	**(0.08)**
Non-surgical prospective/cohort															
Kauffman *et al.* (1992) (9)															
Spanish work place	80	–2.20*	(0.40)	80	$r = 0.24$ $P = 0.01$										
Ewbank *et al.* (1995) (10)															
Total group	45	–13.00*	(1.79)	43	–0.60*	(0.12)							43	–0.20*	(0.05)
Low exercise‡	15	–9.00*	(2.32)	15	–0.30	(0.26)							15	–0.20*	(0.08)
Mod exercise‡	15	–9.00*	(3.01)	14	–0.40*	(0.16)							14	–0.10	(0.08)
High exercise‡	15	–20.00*	(2.58)	14	–10*	(0.19)							14	–0.20*	(0.08)
Sjostrom *et al.* (1999) (11) raw data§															
Women	323	–1.44*	(0.40)	333	–0.02	(0.06)	319	–0.03	(0.06)				24	–0.18*	(0.04)
Men	221	–2.7*	(0.56)	220	–0.26*	(0.09)	213	–0.31	(0.19)				11	0.00	(0.09)
Non-surgical RCTs															
Wing *et al.* (1998) (12)															
Diet	35	–2.10	(1.28)	35	–0.12	(0.10)	35	0.19	(0.41)	35	–0.16	(0.11)	35	0.02	(0.03)
Exercise	31	1.00	(0.84)	31	0.33*	(0.11)	31	0.33	(0.26)	31	0.22	(0.11)	31	0.05	(0.03)
Diet & exercise	32	–2.50	(1.48)	32	0.09	(0.12)	32	–0.28	(0.24)	32	0.12	(0.10)	32	0.02	(0.04)
Hauptman *et al.* (2000) (1)															
Placebo	91	–1.54*	(0.58)	91	0.08	**(0.11)**	91	–0.19	**(0.16)**	91	0.17*	**(0.08)**	91	–0.01	**(0.03)**
Orlistat 120	117	–5.16*	(0.78)	117	–0.15	**(0.10)**	117	–0.09	**(0.14)**	117	–0.15	**(0.07)**	117	0.00	**(0.03)**
Davidson *et al.* (1999) (2)															
Placebo	89	–4.00*	**(0.50)**	89	–0.22	**(0.11)**	89	0.03	**(0.16)**	88	–0.22*	**(0.08)**	89	0.03	**(0.03)**
Orlistat 120	103	–7.60*	**(0.20)**	106	–0.32*	**(0.11)**	106	–0.12	**(0.15)**	104	–0.24*	**(0.07)**	106	–0.01	**(0.03)**
Teupe & Bergis (1991) (13)															
Metformin & diet	25	–4.00*	**(1.42)**	25	–0.39	**(0.22)**	25	–0.25	**(0.31)**						
Diet	29	–5.10*	**(1.39)**	29	0.46*	**(0.20)**	29	–0.27	**(0.28)**						

Bold standard errors indicate mean difference estimated as *follow-up mean – baseline mean*. Standard errors were also estimated as in Table 1.
n, sample size at follow-up for each component.
Wt diff (kg), weight difference between follow-up and baseline in kg.
cholest diff mmol L^{-1}, cholesterol difference between follow-up and baseline as mmol L^{-1}.
Tg diff mmol L^{-1}, triglyceride difference between follow-up and baseline as mmol L^{-1}.
LDL diff mmol L^{-1}, low-density lipoprotein difference between follow-up and baseline as mmol L^{-1}.
HDL diff mmol L^{-1}, high-density lipoprotein difference between follow-up and baseline as mmol L^{-1}.
RCTs, randomized controlled trials.
*$P < 0.05$.

†Definitions of weight patterns for non-surgical weight cyclers from baseline to the end of the 30 months follow-up period:
Gainer, gained >4.5 kg from baseline to 30 months.
Stable, remained within ± 4.5kg of their baseline weight throughout study.
Large cycler, lost ≥9 kg during treatment period but returned to within ±4.5 kg of their baseline weight at the end.
Small cycler, lost 4.5–9 kg during treatment period but returned to within ±4.5 kg of their baseline weight by the end.
Partial cycler, lost ≥9 kg during treatment period and kept off 4.5–9 kg by the end.
Small success, lost 4.5–9 kg during treatment and kept off 4.5–9.0 kg by the end.
Large success, lost ≥9 kg during treatment and had kept off >9.0 kg by the end.
‡Retrospectively grouped into tertiles of exercise levels.
§The raw data of the whole database was kindly made available by the Sjostrom *et al.* (11).

Table 4 Results of surgical weight intervention studies on the effects of weight loss on lipids

Study	*n*	Wt diff kg	(SE)	*n*	Cholest diff mmol L^{-1}	(SE)	*n*	Tg diff mmol L^{-1}	(SE)	*n*	LDL diff mmol L^{-1}	(SE)	*n*	HDL diff mmol L^{-1}	(SE)
Hess & Hess (1998) (14)															
78% F	92	–55.00*	**(2.44)**	92	–1.55*	**(0.11)**	92	–0.98*	**(0.16)**	92	–0.98*	**(0.08)**	92	0.13	**(0.03)**
Gleysteen (1992) (15)															
Women	24	–35.00*	**(3.47)**	24	–0.28	**(0.22)**	24	–0.11	**(0.31)**	24			24	0.26*	**(0.06)**
Men	9	–27.00*	**(4.82)**	9	–0.57	**(0.36)**	9	–0.84	**(0.51)**	9			9	0.26*	**(0.10)**
Rossner & Hallberg (1980) (16)															
Women	10	–44.00*	(4.00)	10	–1.33*	**(0.34)**	10	–0.34	**(0.48)**	10	–1.17*	**(0.23)**	10	0.05	**(0.09)**
Men	8	–42.00*	(4.00)	8	–2.12*	**(0.38)**	8	–1.12	**(0.54)**	8	–1.47*	**(0.26)**	8	–0.08	**(0.10)**
Karason *et al.* (1999) (17)															
21% F	19	–22.00*	(2.29)	19	–0.50*	(0.16)	19	–0.90*	(0.21)	19	–0.40*	(0.16)	19	0.20*	(0.07)
O'leary (18)															
	274	All lost weight except 2. Weight regain of 20–30% with a plateau at 5 years													
	Pre-operative				Hypertriglyceridaemia			51%							
					Hypercholesterolaemia			8%							
	Post-operative				Hypertriglyceridaemia			88% improved; 12% unchanged							
					Hypercholesterolaemia			All improved							

Bold standard errors indicate mean difference estimated as *follow-up mean – baseline mean*. Standard errors were also estimated as in Table 1.
n, sample size at follow-up for each component.
Wt diff (kg), weight difference between follow-up and baseline in kg.
Cholest diff mmol L^{-1}, cholesterol difference between follow-up and baseline as mmol L^{-1}.
Tg diff mmol L^{-1}, triglyceride difference between follow-up and baseline as mmol L^{-1}.
LDL diff mmol L^{-1}, low-density lipoprotein difference between follow-up and baseline as mmol L^{-1}.
HDL diff mmol L^{-1}, high-density lipoprotein difference between follow-up and baseline as mmol L^{-1}.
F, female percentage.
*$P < 0.05$.

One study by Wing *et al.* in 1995 (8) retrospectively regrouped their participants according to their weight cycling status as detailed in Table 3.

- *Gainers*: those who gained 4.5 kg from baseline to 30 months.
- *Stable*: those who remained within ±4.5 kg of their baseline weight throughout the study period.
- *Large cyclers*: those who lost 9 kg or more during the treatment period but who returned to within ±4.5 kg of their baseline weight at the end of the study.
- *Small cyclers*: those who lost between 4.5 kg and 9 kg during the treatment period but who returned to within ±4.5 kg of their baseline weight at the end of the study.
- *Partial cyclers*: those who lost 9 kg or more during the treatment period and kept off 4.5–9 kg at the end of the follow-up period.
- *Small successes*: those who lost 4.5–9 kg during treatment and had kept off 4.5–9 kg by the end of the study.
- *Large successes*: those who lost more than 9 kg during treatment and had kept off more than 9 kg by the end of the study.

Large cyclers, while not having an overall significant weight loss, had a significant drop in LDL levels of 0.29 mmol L^{-1}. Partial cyclers had a significant weight loss of 9.7 kg with a significant drop in LDL of 0.34 mmol L^{-1} and an increase in HDL of 0.1 mmol L^{-1}. Large successes were successful in weight loss but their lipid level changes were unremarkable.

Three studies (9–11) were prospective cohort studies. Like Wing *et al.* (8), the study by Ewbank (10) grouped their participants retrospectively, this time by their recorded levels of exercise. The whole group significantly lost 13 kg as well as having a significant lowering in cholesterol. As levels of exercise increased participants significantly lost increasing amounts of weight along with significantly lowering their cholesterol levels. A significant drop in HDL levels in these subgroups, considered together, was also observed. Both studies by Kauffman *et al.* and Sjostrom *et al.* (9,11) had a diet and exercise intervention, reporting significant drops in cholesterol with modest but significant weight losses (Table 3). Notice that the results for the Sjostrom *et al.* study are not those given in the referenced paper (11), written up about a small subset of their study, but are derived from their full data set for all those suffering from obesity (with kind permission from the authors).

Four RCTs with long-term follow-up were included in the review.

Wing *et al.* in 1998 (12) used diet and exercise as an intervention, whereas Hauptman *et al.*, Davidson *et al.*, and Teupe *et al.* (1,2,13) investigated drug therapy

(Table 3). These trials indicate, in the long term, that weight losses of 5 kg or more are needed to see any benefits in lipids.

Five of the studies had surgical interventions (14–18). These resulted in large weight losses averaging from 20 to 55 kg (Table 4). Lowering of cholesterol and LDL levels are seen along with slight beneficial increases in HDL levels. The study by O'Leary *et al*. was quite different to these other surgical studies in that it investigated hypertriglyceridaemia and hypercholesterolaemia, but again the long-term results were beneficial because post-operative improvements for both of these conditions were observed.

Regression analysis

The relationship between the average lipid outcomes differences and average weight changes are illustrated in Fig. 1(a)–(d). In order to predict how the lipid outcome measures may change as weight changes in the long term, weighted least squares regression was conducted using the inverse of the lipid standard errors as weights. When available the relevant standard errors were used in the weights, otherwise these were estimated as shown in Table 1. Tables 3 and 4 indicate the estimated standard errors in bold.

Although it would be an advantage to consider several independent variables along with weight differences, like follow-up times, intervention grouping and so on, it was felt that within the feasibility and credibility of the studies available at the time of this review such adjustments would further dilute the already limited data. Consequently only one independent variable is considered here, the mean weight difference for each subgroup.

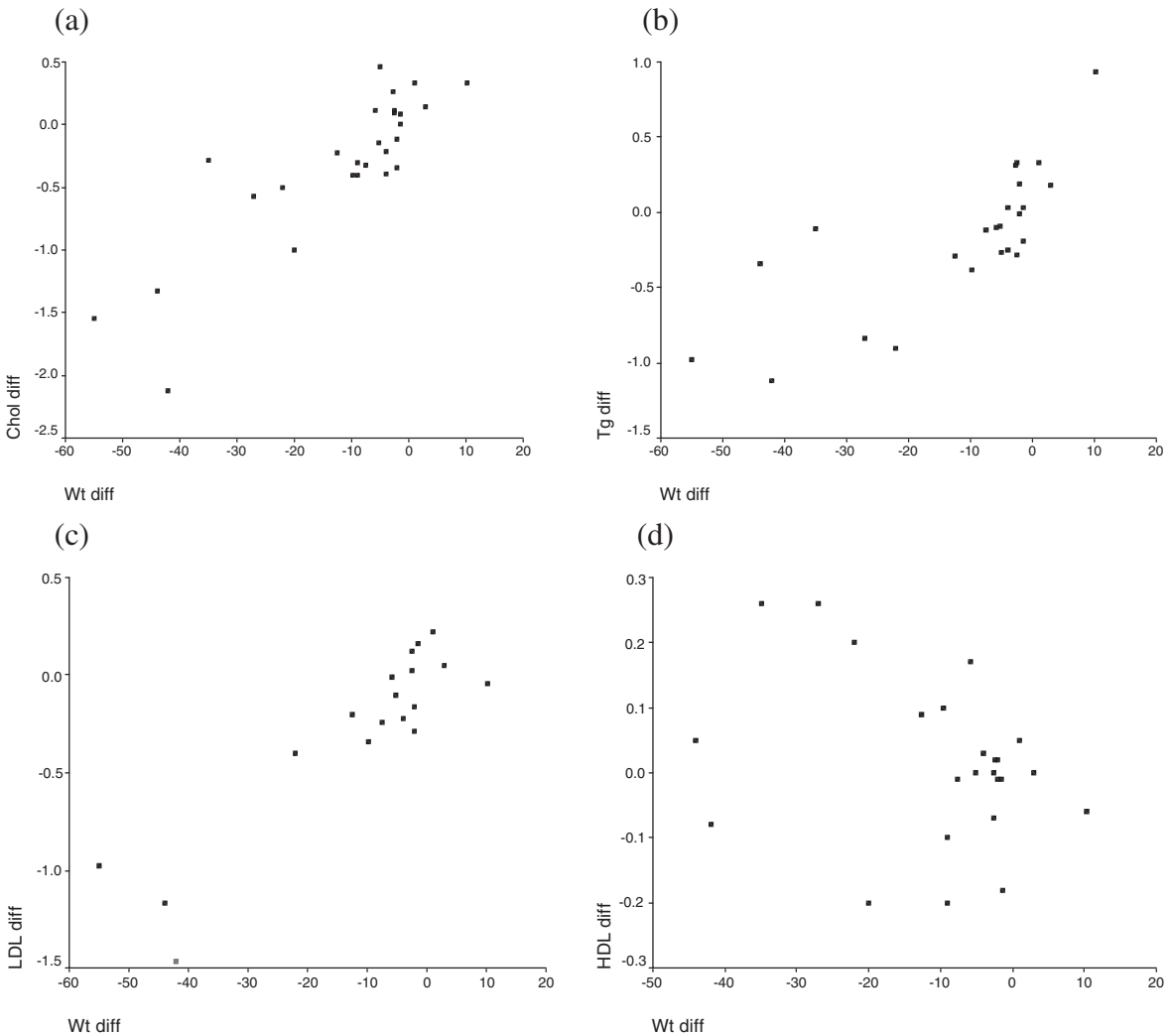

Figure 1 Mean differences (diff) of weight vs. (a) cholesterol (Chol), (b) triglyceride (Tg), (c) low-density lipoprotein (LDL) and (d) high-density lipoprotein (HDL).

Table 5 Optimal weighted least squares linear regression. Each dependent lipid outcome difference predicted from the independent weight change variable

Dependent variable	*n*†	Correlation	Adj R^2	Coefficient	
				Constant	Weight change
Total cholesterol difference	26	0.893***	0.798	0.071*	0.032***
Triglycerides difference	24	0.828***	0.672	0.050	0.020***
LDL difference	18	0.903***	0.804	–0.001	0.020***
HDL	24	–0.308	n/a	n/a	n/a

LDL, low-density lipoprotein; HDL, high-density lipoprotein; n/a, not applicable.
Significance of the coefficients tested using adjusted standard errors for the β-coefficients {127}. *$P = 0.05$, **$P = 0.01$, ***$P < 0.001$.
†Number of subgroups each of varying sample sizes ranging from 7 to 333 participants.

The results from the optimal weighted least squares regression are given in Table 5. As can be seen, cholesterol has a significant positive linear relationship with weight change ($r = 0.89$) where changes in weight explain about 80% of the cholesterol difference variation (Adj $R^2 = 0.79$). The model is given by:

$$\text{Total cholesterol} = 0.071 + 0.032\ (\text{weight change})$$

This suggests that every 10 kg of weight loss may result in an expected drop of 0.23 mmol L^{-1} in cholesterol for a person with obesity.

The models for triglycerides and LDL are similar (Table 5). For these significant models the assumptions for simple linear regression were found to be sufficiently satisfied. In contrast, the results for HDL differences with weight differences (Fig. 1d), indicates a weak non-significant negative fit. This is confirmed by the correlation result given in Table 5 indicating a lack of evidence of linearity – the first assumption required for any linear regression. Hence modelling was not applicable.

Discussion

This review has indicated consistently that weight loss has long-term beneficial effects on lipids, especially on LDL and total cholesterol levels. The HDL response to weight loss is extremely varied. Some studies show small increases in HDL, some show no changes while others show some decreases. The correlation of weight loss and HDL conducted on all the different subgroups from the different studies confirmed this variation by showing that HDL has a poor relationship with weight loss compared to the other lipid levels. The success of weight loss relies on some kind of intervention, with surgical interventions resulting in more dramatic weight losses and consequently greater changes in lipid levels.

We have focused on the measurement of cholesterol, because general practitioners often use this, rather than the full spectrum of lipid measurements, as a starting point to build up a picture of their lipid profile. Previous short-term observations suggest that a 10% decrease in cholesterol may be expected for every 10 kg weight loss (19–21). However, our results show that, in the long term, an average weight loss of 10 kg gives an expected decrease in cholesterol of 0.23 mmol L^{-1} about a 5% drop, that is, half the current expectation. This could be because of some of the studies having comparatively long follow-up especially the surgical intervention subgroups. Under normal circumstances people gain/regain weight and cholesterol levels (for women in particular) rise with age. Hence to some extent the small drop in cholesterol for the longer follow-up times is explainable. This while interesting to pursue would require more data. Consequently without more specific studies to draw on, interpretation of our results should be viewed as indicators of lipid changes with weight loss and not as precise predictors.

Our results show a strong association between weight loss and cholesterol, which is consistent across 13 studies from different countries using different study designs including cohort and RCTs. Further, Fig. 1 and Table 5 support the dose–response relationship for the lipid profile in general although more information would be needed to determine if this is indeed linear or would need adjustment. This provides future evidence of a cause–effect relationship between weight loss and improved lipid profile and is likely to be beneficial in reducing cardiovascular heart disease risk.

The findings of this literature review and analysis of data should be treated with some caution, as there were relatively few studies (13 including RCTs) and there were several methodological shortfalls. Some studies have small subgroupings suffering from lack of power. For instance, 'Large successes' in the weight cycling study by Wing *et al.* 1995 (8) had a substantial weight loss of 12.6 kg (se = 2.63) and cholesterol decrease of 0.23 mmol L^{-1}. Although the lipid changes are statistically non-significant, from a clinical point of view these results are important. The non-significance could be resulting from the small sample size ($n = 14$) for this subgroup.

Loss to follow-up was also an area of concern. In this respect, there was a definite trade-off between the shorter studies, usually RCTs, and the longer prospective cohort studies. Our interest is in the long-term effects of weight loss, ideally spanning 5 or more years, and if these effects are truly to be assessed then the rigorous procedures applied to RCTs as laid out in the Consort Statement need to be appropriately developed for observational studies.

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Obesity Management

Weight loss interventions in young people (18 to 25 year olds): a systematic review

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Summary

This systematic review assesses weight loss interventions in young adults (18–25 years), who are vulnerable to weight gain. This age group experience critical life course points (leaving home for higher studies or job, pregnancy, cohabitation) and develop/establish lifestyle and behavioural patterns making this an opportune intervention period. Medline, Embase, Cinahl, PsychINFO and Cochrane Library were searched (1980 to March 2008). All trials and cohort studies with control groups that assessed weight loss interventions in this specific age group were included finally identifying 14 studies. Before and after comparison of behavioural/motivational interventions (–2.40 kg; 95% CI –5.4 to 0.6) and combination interventions (–2.96; 95% CI –4.4 to –1.5) consistently showed weight loss. Behavioural/motivational interventions increased self-efficacy, the desire to control weight, boosted self-esteem, and increased satisfaction with body areas and appearance. Interventions also showed improvements in HDL cholesterol, insulin, glucose and maximum oxygen uptake. However, recruitment to participation in interventions was a barrier for this age group with small sample sizes and short-term interventions. There may be gender differences in preference to participation in certain type of interventions. Further research to understand attitudes towards healthy lifestyle and preferences of interventions is needed to develop suitable interventions for this vulnerable age group.

Keywords: Systematic review, weight loss, young people.

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Introduction

The prevalence of obesity has been increasing over the past 2–3 decades and become a major public health problem. The recent reports by UK Department of Health (2006) and the Foresight report (2007) indicated that, on current trends, 33% of men and 28% of women will be obese by 2010 (1) with an estimated 60% of males and 50% of females being obese by 2050 (2). Research has identified key time points in the life course, when individuals are vulnerable to the imbalance of the energy equation leading to weight gain. Puberty (3), teenagers leaving home to join University/College (4–7), couples in the early stages of cohabitation (8,9), pregnancy (10–12), smoking cessation (12) and the child rearing years (3) have all been identified as critical times for possible weight gain probably because of the increased food intake and decreased physical activity. Young adults (18–25 years) experience one or more of these critical life course points and are particularly vulnerable to weight gain (13–17).

Current estimates of the prevalence of obesity in the 18–23 years old in UK and the USA ranged from 22.9% (18,19) to 35% (20), and was more in some ethnic groups (50% overweight or obese in African men) (21). Between 1991 and 2001, the greatest increase in obesity (body mass index <30) was found among 18 to 29 year olds (7.1–14%) (22,23) in the USA. Dramatic changes in lifestyle, including decreased physical activity, along with more independent

and increased social living are important factors contributing to weight gain. There is an opportunity for prevention of weight gain in this vulnerable age group, as they develop and establish lifestyle and behavioural patterns.

The aim of this review was to look systematically at the evidence for effective weight loss interventions in 18 to 25 year olds and to identify the barriers and facilitators for implementation within the identified studies.

Methodology

A systematic literature search was undertaken in five electronic bibliographic databases (Medline, Embase, Cinahl, PsychINFO and Cochrane Library) using a robust search strategy. The review included literature published between 1980 and March 2008 with no language restrictions. All trials (randomized controlled trials, controlled clinical trials, non-randomized trials) and cohort studies with control groups of lifestyle interventions undertaken in young adults between the ages of 18–25 years were included in the review. Mesh terms and text words for trials including 'randomised controlled trials', 'controlled clinical trials', 'clinical trials', 'interventions trials' were combined appropriately with terms for 'obesity', 'overweight', 'weight loss' and terms for 'lifestyle', 'diet', 'exercise', 'behaviour' to identify relevant studies.

Drug and surgical interventions, studies in children, adolescents and young people with chronic diseases such as cancer, eating disorders, various syndromes were excluded (Appendix 1). Abstracts that mentioned only 'men and women', 'subjects, adults or participants' were excluded since a sample of 50 full texts revealed that papers with the above terminologies did not focus on young adults. We therefore assumed that papers focused on young adults would mention them in the key words or abstracts. Studies with a wide age range of participants (e.g. 18–65) were also excluded since a check of a sample of full texts of such papers revealed that the mean age in these studies as mid 40s.

To identify relevant studies, abstracts were divided up and read by two independent reviewers. Full articles of the studies meeting the selection criteria were obtained, and initially assessed by two independent reviewers, and then by one reviewer. Relevant foreign language papers were professionally translated to English. The methodological quality of each included study was assessed using a standard quality assessment form adapted from the Cochrane collaboration and Jadad scale (24). Primary studies were assessed on their quality of random allocation of concealment, comparability of groups at baseline, healthcare providers blinding, outcome assessors blinding to interventions, follow-up time, % follow-up, dropout details, use of validated outcome measure, quality of reporting the outcomes and intention to treat analysis. Each of these criteria was graded from 0 to 2 according to the strength of compliance giving a maximum total of 20. Each study was subsequently classified on the basis of the score obtained, with total scores of <10 were considered to be weak, scores between 10 and 15 considered as moderate and scores >15 as strong in quality.

Reference lists of all studies and review articles included were also checked to identify other relevant studies. A data extraction form was designed, piloted and amended before being used by two independent reviewers to extract the data from the papers. Researchers consulted regularly with each other to discuss any inclusion queries as they arose.

Outcome measures assessed were weight loss or change along with risk factors such as total cholesterol, HDL cholesterol, blood glucose, insulin and maximum oxygen uptake.

Statistical analysis

All statistical analyses were performed using SPSS version 17. Results were standardized and presented as means with standard deviations (SDs). When mean differences and associated SDs for body weight and risk factors were not present in the papers, they were estimated from the known SDs of the pre and the post values. Where possible suitable meta-analysis was conducted using either fixed effects model (homogenous studies) or random effects model (heterogeneous studies). Body weight and risk factors were weighted by the inverse of the variance of their respective mean difference, so that the overall weighted mean differences of the various risk factors from all the studies could be estimated. In addition, a meta linear regression model was developed to assess the association of each risk factor with weight status again weighted by the inverse of the variance of the risk factor (25).

Results

The systematic search identified 5160 abstracts from which the full texts of 119 potentially eligible articles were critically appraised. In total, 14 studies met the inclusion criteria. Eight studies were exclusively exercise interventions (26–33). Of the other six studies, two were diet and exercise interventions (34,35), two were exclusively behavioural/motivational interventions (36,37), one study was a combination intervention that had components of diet, physical activity and behavioural skills (38) and one study looked at conjugated linoleic acid (39). The study details and baseline characteristics of the included studies are listed in Table 1. The sample sizes of the studies were all small ranging from 16 to 67. Most studies comprised a single gender; eight with only females, four only males and two studies with both. Five out of eight exercise intervention studies had only male participants. In comparison, five studies out of the six other interventions (diet, physical

Table 1 Study details and baseline characteristics of included studies

Author, year and country	Sample size	Age (years) and sex of participants	Initial BMI or body weight	Type of intervention	Duration and follow-up of interventions	Outcome measures
Exercise interventions						
Kim HD and Park JS 2006 (29) Korea (In Korean)	Total = 44 E: 20 C: 24	Age: range 18–23 Sex: all females	BMI: Mean ± SD E: 22.52 ± 1.57 C: 21.71 ± 1.75	E: aerobic exercise with muscular strength exercises C: no exercise intervention	3 to 5 times a week for 12 weeks No follow-up	Body weight, BMI, Fat mass (kg), % body fat, Lean body mass (kg)
Kondo T *et al.* 2006 (30) Japan	Total = 16 E: 8 C: 8	Age: mean ± SD E: 18.0 ± 1.0 C: 18.0 ± 1.5 Sex: all females	BMI: mean ± SD E: 29.5 ± 2.7 C: 21.9 ± 3.2	E: aerobic endurance exercise in obese females C: no intervention	28 weeks No follow-up	Body weight, BMI, Body fat mass (kg), % body fat, Lean body mass (kg), Total cholesterol, HDL cholesterol, Glucose, insulin and maximum oxygen uptake ($VO_{2\,max}$)
Hara T *et al.* 2005 (28) Japan	Total = 21 E1: 7 E2: 7 C: 7	Age: mean ± SD E1: 19.7 ± 1.3 E2: 18.4 ± 0.5 C: 19.4 ± 1.0 Sex: all males	BMI: mean ± SD E1: 29.9 ± 1.8 E2: 29.9 ± 3.8 C: 33.5 ± 5.6	E1: aerobic exercise training E2: aerobic exercise + resistance exercise training C: no exercise intervention	E1: 3 times a week for 8 weeks E2: 2–3 times a week for 20 weeks No follow-up	Body weight, BMI, Body fat mass (kg), % body fat, Total cholesterol, HDL cholesterol, Glucose, insulin and maximum oxygen uptake ($VO_{2\,max}$)
Fernandez AC *et al.* 2004 (27) Brazil	Total = 28 E1: 10 E2: 9 C: 9	Age: mean ± SD E1: 16.7 ± 1.5 E2: 15.83 ± 0.75 C:16 ± 1.32 Sex: only males and obese	Body weight (kg): mean ± SD E1: 101 ± 11 E2: 99 ± 13 C: 98 ± 14	E1: anaerobic exercise training E2: aerobic training C: no exercise All had nutritional orientation and consultation with nutritionist every month	12 weeks No follow-up	Body weight, BMI, Body fat mass (kg), % body fat
Mayo MJ *et al.* 2002 (31) Singapore	Total = 60 E: 30 C: 30	Age: mean ± SD E: 19.8 ± 0.6 C: 19.2 ± 1.3 Sex: only males and obese	BMI: mean ± SD E: 31.6 ± 2.8 C: 34.1 ± 4.0	E: aerobic exercise – basic military training C: no specific exercise training	780, 1-h training periods for 16 weeks No follow-up	Body weight, BMI, Body fat mass (kg); % body fat; Fat free mass or lean body mass (kg)
Schmidt WD *et al.* 2001 (33) USA	Total = 48 E1: 12 E2: 12 E3: 12 C: 12	Age: mean ± SD E1: 20.7 ± 2.5 E2: 18.3 ± 0.48 E3: 19 ± 0.93 C: 20.8 ± 1.6 Sex: all obese females	BMI: mean ± SD E1: 31.2 ± 3.8 E2: 30.4 ± 3.3 E3: 32.6 ± 3.9 C: 31.4 ± 2.5	E1: aerobic exercise (1 × 30 min daily) E2: aerobic exercise (2 × 15 min daily) E3: aerobic exercise (3 × 10 min daily) C: no exercise	5 day a week for 12 weeks No follow-up	Body weight, BMI and Maximum oxygen uptake ($VO_{2\,max}$)
Eliakim A *et al.* 2000 (26) USA	Total = 44 E: 22 C: 22	Age: mean ± SD E: 16 ± 3.3 C: 16 ± 3.3 Sex: both sexes	Body weight (kg): mean ± SD E: 61.0 ± 8.4 C: 62.2 ± 16.4	E: aerobic endurance exercise training C: no exercise	2–2.5 h a day/5 day a week for 5 weeks No follow-up	Body weight, Total cholesterol, HDL cholesterol
Raz I 1988 (32) Israel	Total = 55 E: 27 C: 28	Age: mean ± SD E: 24.7 ± 0.8 C: 25.0 ± 0.8 Sex: all males	BMI (range) E: 22.6 ± 2.3 C: 23.1 ± 2.0	E: aerobic exercise intervention C: not to change exercise during study period	9 weeks No follow-up	BMI, HDL cholesterol, Glucose, insulin, maximum oxygen uptake ($VO_{2\,max}$)

Table 1 *Continued*

Author, year and country	Sample size	Age (years) and sex of participants	Initial BMI or body weight	Type of intervention	Duration and follow-up of interventions	Outcome measures
Other interventions						
Leidy HJ *et al.* 2004 and 2007 (35,44) USA	Total = 22; 12 E: 15; 8 C: 7; 4	Age: mean ± SD E: 20 ± 3.9 C: 20 ± 2.6 Sex: all females	BMI: mean ± SD E: 21.9 ± 2.3 C: 20.7 ± 1.5	Combination (diet and exercise): E: energy deficit group (negative energy balance ranging from –30% to –60%) C: no exercise and consumed enough to maintain weight	12 weeks No follow-up	Body weight, BMI, Body fat mass (kg), % body fat, Fat free mass or lean body mass (kg) and Maximum oxygen uptake ($VO_{2\,max}$)
Eiben G and Lissner L 2006 (38) Sweden	Total = 40 E: 18 C: 22	Age: mean ± SD E: 22.7 ± 2.5 C: 22.3 ± 2.8 Sex: all females	BMI: mean ± SD E: 28.1 ± 5.9 C: 25.9 ± 5.6 One of their parents were obese	Combination (diet, exercise and behaviour): E: health hunters: package with 3 themes-physical activity, diet and behavioural skills for weight control C: no intervention	52 weeks No follow-up	Body weight, BMI, % body fat, Lean body mass
Ames GE *et al.* 2005 (36) USA (PILOT STUDY)	Total = 67 E: NR C: NR	Age: mean ± SD E: 21.5 ± 2.2 C: 21.5 ± 2.2 Sex: all females	BMI: mean ± SD E: 31.1 ± 2.9 C: 31.1 ± 2.9	Behavioural and motivational intervention: E: standard behavioural intervention with restricted diet and exercise – 10 sessions + reformulated cognitive behavioural intervention – 10 sessions C: standard behavioural intervention with restricted diet and exercise – 20 sessions	Duration not reported had 20 sessions Follow-up 24 weeks	Body weight, self-esteem, Beck depression inventory, self-confidence (MWLQ-Motivations for weight loss questionnaire)
Eyjolfson E *et al.* 2004 (39) Canada	Total = 16 E: 10 C: 6	Age: mean ± SD E: 21.4 ± 1.6 C: 21.6 ± 1.9 Sex: both sexes (F = 12; M = 4)	BMI: mean ± SD E: 26.9 ± 4.7 C: 28.4 ± 7.3	Conjugated linoleic acid: E: conjugated linoleic acid capsules C: placebo capsule with safflower oil	8 weeks No follow-up	Body weight, BMI, % Body fat, Glucose and insulin
Oka M 1998 (37) Japan (Japanese paper)	Total = 22 E: 11 C: 11	Age: mean ± SD E: 20.9 ± 2.6 C: 20.0 ± 0.0 Sex: all females	Body weight (kg): mean ± SD E: 57.9 ± 9.8 C: 57.8 ± 6.8	Behavioural and motivational intervention: E: motivational intervention: enhance self-efficacy and desire for weight control C: knowledge based: only lectures	2 weeks No follow-up	Body weight, % body fat, self-efficacy and Desire for weight control
Hazama *et al.* 1994 (34) Japan	Total = 16 E: 10 C: 6	Age: mean ± SD Range 18–24 E: 20.7 ± 1.4 C: 20.9 ± 1.7 Sex: all females	BMI (range) E: 25.0–29.9 C: 25.0–29.9	Combination (diet and exercise): E: aerobic exercise programme plus dietary advice C: no intervention	15 weeks No follow-up	Body weight, Body fat mass (kg), % body fat, Fat free mass or lean body mass (kg), Total cholesterol, HDL cholesterol and Maximum oxygen uptake ($VO_{2\,max}$)

C, control group; E, experimental group; NR, not reported.

activity and cognitive behaviour) were conducted only on females and one study had both sexes (39). The interventions were delivered over periods ranging from 2 weeks in one study (37) to 52 weeks in another study (38). Most of the interventions lasted for 2–6 months, most commonly 12 weeks. Outcomes were always assessed immediately after the intervention except for one study (36) which also had a follow-up of 6 months after the completion of intervention. On the methodological quality assessment, most of the studies were scored to be 'moderate' in quality with only two studies scoring as 'strong' (35,38) and the other two as 'weak' (31,34).

Although all the studies, except one (30) were classified as controlled trials, either the control groups comprised of people who were of normal weight (30), or the control group was significantly different to the experimental group at baseline (31,32), making them non-comparable. Of the remaining studies with comparable control groups, only two studies provided change over time data for both intervention and the control groups. Consequently for this review, imputed (estimated) information for both intervention and control group would have been required, a process which each time reduces credibility. In addition, most of the studies themselves compared before and after the intervention rather than comparing the experimental group with the control group. Hence, for this review any study group which received an intervention (even if the original paper called this a control group) was considered longitudinally. Given the lack of suitable control in most of the studies, all study groups were analysed as before and after so that the 14 studies provided a total of 20 study groups. The details of the studies are presented in Table 2. The interventions were grouped according to the type of intervention into six categories: Aerobic exercise, Aerobic with resistance exercise, Anaerobic exercise, Conjugated Linoleic acid, Combination interventions and Behavioural and motivational interventions.

Although 10 study groups of aerobic exercises were grouped together, they differed with respect to intervention components, delivery and duration of exercises. This along with the fact that anaerobic exercise, aerobic with resistance exercise and conjugated Linoleic acid interventions were all single studies, made the comparison of the different interventions inappropriate. A meta combination (25) of all the study groups showed, that on average the mean weight loss among young people, irrespective of intervention type was a non-significant –3.01 kg (95% CI –8.5 to 2.5) (Fig. 1). However, looking at mean weight changes with different types of interventions, the behavioural/motivational interventions (–2.40 kg; 95% CI –5.4 to 0.6) and interventions that combine diet, exercise and motivational skills (–2.96 kg; 95% CI –4.4 to –1.5) seem to consistently show weight loss with narrow confidence intervals. Aerobic exercise interventions, although showing a mean weight loss of –3.37 kg, had a wide confidence interval of –10.75 to 3.99 (Fig. 1). The single study interventions also show weight loss with limited interpretation given their wide confidence intervals.

A similar meta-combination of the risk factors (total cholesterol, HDL cholesterol, blood glucose, insulin and maximum oxygen uptake) across study groups also showed some improvements with intervention. Irrespective of intervention, HDL cholesterol showed significant improvement having a mean weighted HDL cholesterol difference of 0.06 mmol L^{-1} (95% CI 0.03 to 0.19). There was a non-significant slight decrease in total cholesterol level of –0.02 mmol L^{-1} (95% CI –0.29 to 0.26) with wide confidence interval. Both insulin and glucose levels were significantly reduced with weight loss interventions (Insulin: –9.65 pmol L^{-1} (95% CI –15.35 to –3.96); Glucose: –0.26 mmol L^{-1} (95% CI –0.41 to –0.11). The maximum oxygen uptake showed an improvement with weight loss, with a weighted mean difference of 4.38 mL kg^{-1} min^{-1} (95% CI –0.13 to 8.89), although again not significant and with a wide confidence interval. Comparison of the effects of the different types of intervention on the individual risk factors is inappropriate because of limited number of studies in each type.

The question of whether weight changes were associated with changes in the risk factors was considered using meta-regression (weighted by each of the risk factors). The only significant change was for the HDL Cholesterol. Data for this was available from five studies (six sub-groups). The resulting model accounted for 62% of the variance in the HDL as predicted by the weight changes. The model showed that weight changes reliably predicted the HDL levels ($F = 9.090$ and $P = 0.03$) whereby one kilogram decrease in weight predicted a 0.03 mmol L^{-1} increase in the HDL.

In addition to the weight and risk factor changes, the two behavioural/motivational intervention studies (36,37) also assessed self-esteem, satisfaction with body areas, appearance and self-efficacy in diet control. The behavioural/motivational interventions not only helped with weight reduction, but were associated with increased self-efficacy of diet controlling behaviour (mean change of 2.78 ± 4.70) and the desire to control weight (mean change 0.40 ± 2.00) (37); and also seem to boost self-esteem and increased satisfaction with body areas and appearance (Table 2).

Discussion

This systematic review is the first to focus specifically on young people, a vulnerable group for weight gain, and to assess obesity interventions conducted among them. The interventions specific for weight loss showed some effects in young people however, the varied components and

Table 2 Results of exercise interventions and other interventions

Author & year and type	Intervention with age and sex of participants	Results			
Exercise interventions					
Kim HD and Park JS 2006 (29) Korea (Korean paper) RCT Quality: moderate	Intervention: aerobic exercise Age: range 18–23 years Sex: all females		Pre-test mean (SD) ($n = 20$)	Post-test mean (SD) ($n = 20$)	Mean change (SD)
		Body weight (kg)	56.70 (4.48)	55.60 (4.20)	–1.10 (6.14)
		BMI (kg m^{-2})	22.52 (1.57)	22.38 (1.76)	–0.14 (2.36)
		Body fat mass (kg)	19.60 (2.85)	18.89 (2.68)	–0.71 (3.91)
		% body fat	34.47 (3.01)	33.41 (2.92)	–1.06 (4.19)
		Lean body mass (kg)	37.09 (2.54)	37.40 (2.93)	0.31 (3.88)
		Mean change and the SD of the mean change was estimated.			
Kondo T *et al.* 2006 (30) Japan Cohort study retrospectively compared with a control group Quality: moderate	Intervention: aerobic exercise Age: mean ± SD E: 18.0 ± 1.0 Sex: all obese females		Pre-test mean (SD) ($n = 8$)	Post-test mean (SD) ($n = 8$)	Mean change (SD)	*P*-value
		Body weight (kg)	72.5 (6.9)	64.5 (4.1)	–8.00 (8.03)	<0.05
		BMI (kg m^{-2})	29.5 (2.7)	26.3 (5.1)	–3.20 (5.77)	<0.05
		Body fat mass (kg)	21.7 (2.1)	16.5 (2.3)	–5.20 (3.11)	<0.05
		% body fat	29.8 (0.9)	25.6 (4.6)	–4.20 (4.69)	<0.05
		Lean body mass (kg)	50.3 (4.9)	48.2 (8.5)	–2.10 (9.81)	<0.05
		T cholesterol (mmol L^{-1})	4.84 (0.66)	4.51 (0.32)	–0.35 (0.73)	NS
		HDL cholesterol (mmol L^{-1})	1.14 (0.26)	1.42 (0.17)	0.28 (0.31)	<0.05
		Fasting plasma glucose (mmol L^{-1})	5.31 (0.48)	4.99 (0.57)	–0.31 (0.74)	NS
		Insulin (pmol L^{-1})	34.03 (7.63)	31.3 (14.58)	–2.77 (16.45)	NS
		$VO_{2\ max}$ (mL kg^{-1} min^{-1})	28.8 (2.5)	32.5 (1.5)	3.70 (2.92)	<0.05
		Student's paired *t*-test was used.				
		Mean change and the SD of the mean change was estimated.				
Hara T *et al.* 2005 (28) Japan RCT Quality: moderate	Intervention: E1: aerobic exercise E2: aerobic exercise + resistence exercise Age: mean ± SD E1: 19.7 ± 1.3 E2: 18.4 ± 0.5 Sex: all males	Paper reports no baseline differences between groups.					
			E1: pre-test mean (SD) ($n = 7$)	E1: post-test mean (SD) ($n = 7$)	E1: mean change (SD)	E2: pre-test mean (SD) ($n = 7$)	E2: post-test mean (SD) ($n = 7$)	E2: mean change (SD)
		Body weight (kg)	91.3 (7.8)	90.2 (7.0)	–1.10 (10.48)	90.6 (12.5)	86.6 (11.4[a])	–4.00 (16.92)
		BMI (kg m^{-2})	29.9 (1.8)	29.6 (1.7)	–0.30 (2.48)	29.9 (3.8)	28.6 (2.8[a])	–1.30 (4.72)
		Fat mass (kg)	25.5 (4.5)	24.3 (5.0[a])	–1.20 (6.73)	22.4 (5.5)	18.6 (3.8[b])	–3.80 (6.69)
		% body fat	27.8 (3.0)	26.8 (3.8)	–1.00 (4.84)	24.5 (3.6)	21.3 (2.0[b])	–3.20 (4.12)
		T cholesterol (mmol L^{-1})	4.27 (0.80)	4.48 (0.93)	0.21 (1.26)	3.97 (0.59)	4.29 (0.36[a])	0.32 (0.71)
		HDL cholesterol (mmol L^{-1})	1.03 (0.17)	1.09 (0.17)	0.06 (0.24)	1.03 (0.13)	1.39 (0.23[b])	0.36 (0.26)
		Bld glucose (mmol L^{-1})	5.25 (0.29)	5.22 (0.13)	–0.03 (0.32)	5.59 (0.49)	5.24 (0.33[a])	–0.36 (0.59)
		Insulin (pmol L^{-1})	111.1 (45.1)	76.39 (28.5)	–34.73 (53.40)	58.3 (20.14[#])	55.6 (4.17)	–2.78 (20.56)
		$VO_{2\ max}$ (mL kg^{-1} min^{-1})	30.1 (6.40)	31.3 (5.90)	1.20 (8.70)	30.4 (4.60)	40.5 (1.6[c])	10.50 (4.87)
		Training effects on each variable was tested by student's paired *t*-test. Mean change and the SD of the mean change was estimated. Alphabets is significant differences before and after intervention, [a]$P < 0.05$; [b]$P < 0.01$; [c]$P < 0.001$; [#]Aerobic vs. aerobic and resistance exercise ($P < 0.05$) at pre-interventions.						

Table 2 *Continued*

Author & year and type	Intervention with age and sex of participants	Results

Fernandez AC *et al.* 2004 (27)
Brazil
RCT
Quality: moderate

Intervention:
E1: anaerobic exercise
E2: aerobic training
Age: mean ± SD
E1: 16.7 ± 1.5
E2: 15.8 ± 0.75
Sex: only males and obese

No baseline differences between interventions groups.

	E1: pre-test mean (SD) ($n = 10$)	E1: post-test mean (SD) ($n = 10$)	E1: mean change (SD)	E2: pre-test mean (SD) ($n = 9$)	E2: post-test mean (SD) ($n = 9$)	E2: mean change (SD)
Body weight (kg)	101 (11)	98 (12*)	–3.00 (16.28)	99 (13)	96 (13*)	–3.00 (18.38)
BMI (kg m^{-2})	33 (3)	31 (3*)	–2.00 (4.24)	33 (3)	32 (3*)	–1.00 (4.24)
Body fat mass (kg)	37.1 (9.2)	33.1 (9.2*)	–4.00 (13.01)	36.7 (7.5)	32.8 (6.6*)	–3.90 (9.99)
% body fat	36.9 (7.0)	34.0 (7.3*)	–2.90 (10.11)	37.4 (5.8)	34.3 (5.5*)	–3.10 (7.99)

Mean change and the SD of the mean change was estimated.
*Differences between initial and final evaluations ($P < 0.05$); between initial and final periods: paired *t*-test.

Mayo MJ 2002 (31)
Singapore
Non-RCT
Quality: weak

Intervention: aerobic – basic military training
Age: mean ± SD
E: 19.7 ± 0.6
Sex: only males and obese

	Pre-test mean (SD) ($n = 30$)	Post-test mean (SD) ($n = 30$)	Mean change (SD)
Body weight (kg)	94.7 (9.8)	82.7 (8.5***)	–12.00 (12.97)
BMI (kg m^{-2})	31.6 (2.8)	27.6 (2.6***)	–4.00 (3.82)
Fat mass (kg)	28.3 (4.7)	17.0 (4.1***)	–11.30 (6.24)
% body fat	29.7 (2.6)	20.6 (3.3***)	–9.10 (4.20)
Fat free mass or lean body mass (kg)	66.4 (6.1)	65.8 (5.4)	–0.60 (8.15)

Mean change and the SD of the mean change was estimated.
*$P < 0.01$, ***$P < 0.001$. Pre/post comparisons within the group: differences before and after training done by paired student's *t*-test.

Schmidt WD *et al.* 2001 (33)
USA
Non-RCT
Quality: moderate

Intervention: aerobic exercise with different durations
E1: 1 × 30 min
E2: 2 × 15 min
E3: 3 × 10 min
Age: mean ± SD
E1: 20.7 ± 2.5
E2: 18.3 ± 0.48
E3: 19 ± 0.93
Sex: all females and obese

No baseline differences between groups.

	E1: 1 × 30 mean difference (SD) ($n = 12$)	E2: 2 × 15 mean difference (SD) ($n = 10$)	E3: 3 × 10 mean difference (SD) ($n = 8$)
Body weight (kg)	–2.7 (1.1)	–2.96 (1.3)	–4.36 (2.3)
BMI (kg m^{-2})	–1.1 (0.6)	–1.1 (0.4)	–1.6 (0.9)

For body weight and BMI, mean difference and SDs' of the difference were given.

	E1: pre-test mean (SD) ($n = 12$)	E1: post-test mean (SD) ($n = 12$)	E1: mean change (SD)	E2: pre-test mean (SD) ($n = 12$)	E2: post-test mean (SD) ($n = 10$)	E2: mean change (SD)	E3: pre-test mean (SD) ($n = 12$)	E3: post-test mean (SD) ($n = 8$)	E3: mean change (SD)
$VO_{2\ max}$ (mL kg^{-1} min^{-1})	21.08 (0.490)	23.53 (0.572)	2.45 (0.75)	20.91 (0.478)	22.94 (0.558)	2.03 (0.73)	22.32 (1.139)	23.92 (1.367)	1.59 (1.78)

For $VO_{2\ max}$ baseline and post intervention values were given with the SD's only for the baseline value. The SD for the post $VO_{2\ max}$, was estimated from the graphs. In addition, the values for $VO_{2\ max}$ were converted from L min^{-1} to mL kg^{-1} min^{-1} using the formula: value in L min^{-1} ×1000 and divided by the body weight in kg. Mean change and the SD of the mean change for $VO_{2\ max}$ was estimated.

Eliakim A *et al.* 2000 (26)
USA
RCT
Quality: moderate

Intervention: aerobic endurance training
Age: mean ± SD
E: 16 ± 3.3
Sex: both sexes

	Pre-test mean (SD) ($n = 22$)	Post-test mean (SD) ($n = 20$)	Mean change (SD)
Body weight (kg)	61.0 (8.44)	61.8 (9.381)	0.80 (12.62)
Cholesterol (mmol L^{-1})	3.45 (1.09)	3.50 (1.09)	0.05 (1.55)
HDL cholesterol (mmol L^{-1})	0.98 (0.21)	1.02 (0.22)	0.04 (0.30)

ANOVA followed by modified *t*-tests by the method of Duncan for intergroup comparisons, if ANOVA was significant.
SDs' were calculated from the SEs given in the paper. Mean change and the SD of the mean change was estimated.
*Pre vs. post within groups, $P < 0.05$.

Table 2 *Continued*

Author & year and type	Intervention with age and sex of participants	Results				
Raz I *et al.* 1988 (32) Israel RCT Quality: moderate	Intervention: aerobic exercise Age: mean ± SD E: 24.7 ± 0.8 Sex: all males		Pre-test mean (SD) ($n = 28$)	Post-test (9 weeks) mean (SD) ($n = 28$)	Mean change (SD)	*P
		Body weight			0.62 (1.33)	
		BMI (kg m^{-2})	22.6 (2.3)	22.8 (2.4)	0.2 (0.43)	0.05
		HDL cholesterol (mmol L^{-1})	0.84 (0.14)	0.88 (0.15)	0.03 (0.14)	0.25
		Glucose (mmol L^{-1})	8.84 (0.47)	8.11 (0.59)	0.54 (0.69)	0.001
		Insulin (pmol L^{-1})	63.06 (26.32)	51.05 (18.82)	11.95 (20.63)	0.005
		$VO_{2\ max}$ (mL kg^{-1} min^{-1})	38.6 (7.9)	44.1 (7.6)	5.5 (5.7)	0.001
		Values for glucose were converted from mmol L^{-1} to mg dL^{-1} by dividing by the conversion factor (0.0555). Mean change in weight and the SD of the weight change was calculated from BMI and given mean height of the participants. *Paired *t*-test for difference between baseline and 9 weeks.				
Other interventions						
Leidy HJ *et al.* 2007 (35,44) USA RCT Quality: strong	Intervention: combination (diet and aerobic exercise) Age: mean ± SD E: 20 ± 3.9 Sex: all females		Pre-test mean (SD) ($n = 8$)	Post-test mean (SD) ($n = 8$)	Mean change (SD)	
		Body weight (kg)	59.60 (5.09)	57.10 (5.37)	–2.50 (2.55)	
		BMI (kg m^{-2})	21.9 (1.69)	21.0 (1.98)	–0.91 (0.85)	
		Fat mass (kg)	16.4 (3.96)	13.6 (4.24)	–2.8 (2.26)	
		% body fat	27.4 (5.66)	23.6 (5.37)	–3.8 (2.83)	
		Fat free mass (kg)	43.2 (4.24)	43.5 (3.11)	0.3 (1.98)	
		$VO_{2\ max}$ (mL kg^{-1} min)	37.6 (4.24)	46.0 (5.09)	8.26 (5.09)	
		SDs' were calculated from the SEs given in the paper. $VO_{2\ max}$: maximal oxygen uptake. †Pre- vs. post-study in energy deficit group; two tailed Wilcox test ($P < 0.05$).				
Eiben G and Lissner L 2006 (38) Sweden RCT Quality: strong	Intervention: combination (diet, physical activity and behavioural skills) Age: mean ± SD E: 22.7 ± 2.5 Sex: all females, overweight participants		Pre-test mean (SD) ($n = 18$) (post $n = 14$)		Mean change (SD)	
		Body weight (kg)	79.6 (14.43)		–3.2 (7.483)	
		BMI (kg m^{-2})	28.1 (5.94)		–1.3 (2.81)	
		% Body fat	40.8 (8.91)		–3.0 (5.24)	
		Lean body mass (kg)	NR		2.8 (5.24)	
		SDs' were calculated from the SEs given in the paper.				
Ames GE *et al.* 2005 (36) USA (PILOT STUDY) RCT Quality: moderate	Intervention: behavioural E1: reformulated cognitive behavioural intervention E2: standard behavioural intervention Age: mean ± SD E: 21.5 ± 2.2 Sex: all females		E1: pre-test mean (SD) ($n = 14$)	E1: post-test mean (SD) ($n = 13$)	E1: mean change (SD)	*P*-value
		Body weight (kg)	85.6 (16.5)	81.7 (6.1)	–3.80 (3.9)	<0.05
		Self-esteem	21.8 (5.6)	18.2 (7.4)	–3.60 (9.28)	NS
		BDI-II	9.3 (7.1)	4.5 (6.1)	–4.80 (9.36)	<0.05
		MBSRQ-BAS	21.2 (3.2)	23.3 (4.2)	2.10 (5.28)	<0.08
		MBSRQ-AS	60.5 (11.8)	54.3 (8.4)	–6.20 (14.48)	<0.05
			E2: pre-test mean (SD) ($n = 14$)	E2: post-test mean (SD) ($n = 13$)	E2: mean change (SD)	*P*-vlaue
		Body weight (kg)	83.6 (8.4)	79.9 (9.5)	–3.80 (5.00)	<0.05
		Self-esteem	24.2 (8.4)	17.8 (8.2)	–6.40 (11.74)	<0.05
		BDI-II	12.5 (11.0)	6.7 (6.9)	–5.80 (12.98)	<0.08
		MBSRQ-BAS	20.5 (3.9)	24.1 (4.6)	3.60 (6.03)	<0.05
		MBSRQ-AS	60.0 (10.9)	56.1 (12.0)	–3.90 (16.21)	NS
		Apart from body weight, the mean change and the SD of the mean change was estimated. Post-test mean is end of 6 months follow-up; Repeated measures of 2 × 2 ANOVAS with time periods and two treatment conditions. Self-esteem, from Rosenberg Esteem scale (High scores indicate low levels of self-esteem). BDI-II, Beck Depression Inventory – II; MBSRQ-BAS, Multidimensional body Self Relations Questionnaire – Body Areas Satisfaction Scale (low scores indicate greater dissatisfaction); MBSRQ-AS, Multidimensional body Self Relations Questionnaire – Appearance Scale (high scores indicate greater dissatisfaction).				

Table 2 *Continued*

Author & year and type	Intervention with age and sex of participants	Results					
Eyjolfson V *et al.* 2004 (39) Canada CCT Quality: moderate	Intervention: conjugated linoleic acid Age: mean ± SD E: 21.4 ± 1.6 Sex: both sexes (12 females and 4 males)		Pre-test mean (SD) ($n = 10$)	Post-test mean (8 weeks) (SD) ($n = 10$)	Mean change (SD)	*P*-value	
		Body mass (kg)	74.2 (9.49)	74.8 (8.85)	0.60 (12.98)	NS	
		BMI (kg m^{-2})	26.9 (4.74)	27.1 (4.74)	0.20 (6.71)	NS	
		% body fat	25.6 (8.85)	26.4 (9.49)	0.80 (12.98)	NS	
		Blood glucose (mmol L^{-1})	4.09 (0.63)	3.99 (0.63)	–0.09 (0.89)	NS	
		Fasting insulin (pmol L^{-1})	118.96 (44.24)	83.96 (22.15)	–35.00 (49.52)	<0.05	
		Values for glucose were converted from mmol L^{-1} to mg dL^{-1} by dividing by the conversion factor (0.0555). Values for insulin were converted from pmol L^{-1} to (μU L^{-1}) by dividing by the conversion factor (6.945). SDs' were calculated from the SEs given in the paper.					
Oka M 1998 Japan (37) (Japanese paper) RCT Quality: moderate	Intervention: behavioural E1: motivation intervention-enhance self-efficacy E2: knowledge based-lecture Age: mean ± SD E: 20.9 ± 2.6 Sex: all females		E1: pre-test mean (SD) ($n = 11$)	E1: post-test mean (SD) ($n = 10$)	Mean change (SD)	E2: pre-test mean (SD) ($n = 11$)	E2: post-test mean (SD) ($n = 9$)	Mean change (SD)
		Body weight (kg)	57.9 (9.8)	NR	–1.36 (0.79)	57.8 (6.8)	NR	–1.06 (0.93)
		% body fat	29.3 (6.8)	NR	–0.54 (0.95)	27.9 (5.2)	NR	0.20 (1.00)
		SE in diet control	1.20	4.44**	3.24	1.00	0.33	–0.67
		SE in controlling dietary behaviour	2.00	4.78**	2.78	4.70	2.11*	–2.59
		Desire for weight control	1.60	2.00	0.40	2.00	0.56***	–1.44
		Network for supporting own dietary behaviour	12.1	14.0	1.90	12.9	13.5	0.60
		SE in performing diet score: based on eight 3-point scales (very confident, confident and not confident): SE in controlling dietary behaviour score: based on seven 3-point scale; Desire for weight control: based on five 3-point scale; Net work for supporting own dietary behaviour score: based on nine 3-point scale. Stats tests used were Mann–Whitney *U* and Wilcoxon tests (Japanese Paper); for self-efficacy outcomes mean change was estimated. *Difference between pre and post values within each group: $*P < 0.05$; $**P < 0.01$; $***P < 0.005$. NR, not reported; SE, self-efficacy.					
Hazama T *et al.* 1994 (34) Japan Non-RCT Quality: weak	Intervention: combination E: monitored exercise programme plus dietary advice: 10 Age: mean ± SD E: 20.7 ± 1.4 Sex: all females		Pre-test mean (SD) ($n = 10$)	Post-test mean (SD) ($n = 10$)	Mean change (SD)	*P*-value	
		Weight (kg)	64.6 (3.8)	60.2 (3.6)	–4.40 (5.23)	<0.05	
		Fat mass (kg)	21.7 (3.0)	17.5 (3.1)	–4.20 (4.31)	<0.05	
		% body fat	33.5 (3.2)	29.1 (3.4)	–4.40 (4.67)	<0.05	
		Fat free weight or lean body mass (kg)	42.9 (2.8)	42.7 (3.0)	–0.20 (4.10)	NS	
		Cholesterol (mmol L^{-1})	4.84 (0.84)	4.67 (0.72)	–0.17 (1.11)	NS	
		HDL cholesterol (mmol L^{-1})	1.49 (0.31)	1.57 (0.27)	0.07 (0.41)	NS	
		$VO_{2\ max}$ (mL kg^{-1} min^{-1})	32.0 (4.4)	36.2 (4.3)	4.20 (6.15)	<0.05	
		Mean change and the SD of the mean change was estimated.					

CCTs, trials where randomization was done by birth dates or alternate allocation to group etc; Cohort with control group, cohort study with a control group at the end of the study for comparison; Non-RCT: trials but not randomly allocated or studies where it was not clear how they were allocated to the groups; RCT, randomized controlled trials.

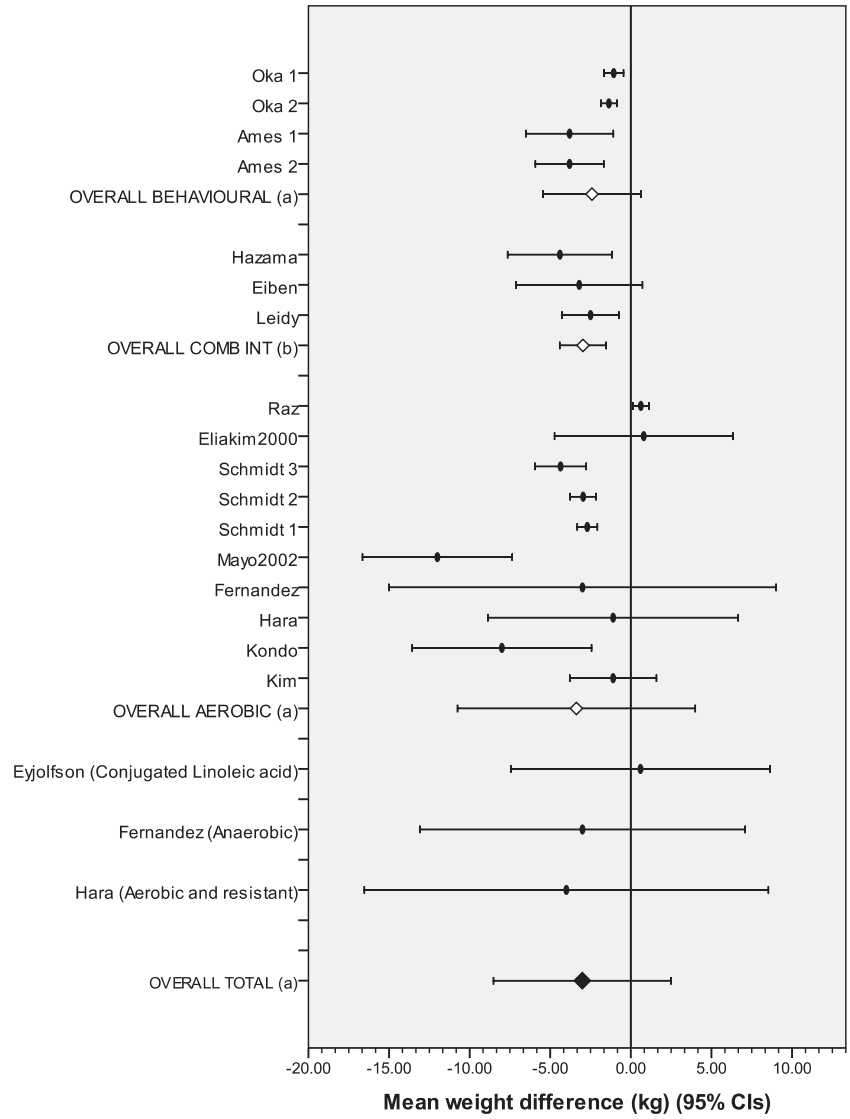

Figure 1 Mean weight difference according to the type of interventions (a: random effects model for heterogeneous studies; b: fixed effect model for homogenous studies).

duration of the interventions makes it difficult to identify the most effective intervention for weight loss in this age group. Interventions showed significant improvements in HDL cholesterol, insulin and glucose levels with no significant improvements in some other risk factors such as total cholesterol and oxygen uptake. It is worth noting that in spite of short intervention periods, two studies that looked at psychological outcomes showed significant improvement in self-esteem, motivation and satisfaction with body image which are crucial factors for this age group. Meta regression only showed evidence of a relationship between weight loss and improvements in HDL cholesterol unlike in adult populations where weight loss gives benefits for total cholesterol levels, reduces the risk of developing diabetes and evidence of some hypertension reduction in certain groups (40–42). The lack of improvement in this younger target group for some of the disease risk factors could be due to the fact that the initial cholesterol and other risk factor levels were normal at baseline among the subjects giving less scope for improvement. The interpretation of this result is also complicated by the small sample sizes and virtually no follow-up after the completion of the intervention in any of the studies.

The small sample sizes of the included studies highlights a major recruitment issue in young people. Some of the studies included in this review reported that they were unable to recruit in spite of planning the study with larger numbers and also reported problems of high attrition rates (36,38). Some of the studies have acknowledged the small numbers as a limitation of their study but did not give any reasons (27,30). It is not clear from the other papers if the studies tried to recruit more and failed or if they always intended to recruit only a few. Of the 20 sub-groups in this review, 11 were already overweight or obese at the start of

the interventions highlighting the increasing vulnerability of this age group. In spite of this, the number of young people participating in studies seems to be low and it is complicated by the fact that this is an age group that is more difficult to monitor and follow-up. Consequently, studies that focus on either children or adults ignore this young and vulnerable age group as it forms the opposite tails of both groups.

Most of the interventions included in this review were conducted in strictly controlled environments either as part of compulsory university course giving credits for participation or as part of training programmes (i.e. military training). Six of the included studies were aimed specifically at weight loss or looked at effects of interventions on obesity, whereas some focused on risk factors/biochemical markers and/or psychological outcomes and only measured weight loss as a secondary outcome. The disparate nature of interventions, participants, settings and aims of studies restricts the generalizability of the findings and highlights the paucity of data for this age group. In addition to small sample sizes, most of the interventions were short term ranging from 2 weeks with only one point of contact (37) to 28 weeks. There was one paper reporting on a lifestyle intervention lasting for a year, which may have only been possible since it was part of the well established Swedish Obesity Study (SOS) (38). Again none of the studies had any follow-up after the completion of intervention except one study with 6 months (36). The short-term nature of some of the interventions of only 2 weeks (37) and the lack of follow-up in most studies could explain the lack of real benefits observed in the measured risk factors. Long-term cohort studies with larger samples might be useful to assess such health benefits associated with weight loss/maintenance.

Within the studies included in this review, there seems to be a trend that men participate more in exercise training programmes while women undergo more diet and behavioural intervention programmes as highlighted in previous studies (43). This necessitates further exploration to understand the reasons for young people's participation and/or their choice of intervention in obesity prevention or treatment programmes.

This review initially set out to assess the controlled trials, with an intention to compare the intervention with controls. However, a direct comparison was deemed inappropriate because of (i) non-comparable control groups at the baseline; (ii) few studies reporting change data requiring imputation and (iii) singleton interventions. Studies also had disparate study design, small sample sizes, duration of intervention and follow-up. Consequently, only before and after comparisons were conducted on 'intervention' arms, treating each active study arm as individual studies, limiting the robustness of the review. There is also a small chance that studies conducted in young people were missed because they mentioned only 'subjects' and 'participants' without the specific age group.

In summary, young people aged between 18 and 25 years are vulnerable to weight gain and do show improvements in body weight regardless of the type of weight loss intervention. Small sample sizes may highlight the reluctance of young people to participate in any kind of health intervention. However, the included studies suggest preference of intervention by gender. Consequently, understanding their knowledge, attitudes towards leading healthy lifestyles and preferences/choice of interventions is crucial. This will help to develop interventions with components designed to motivate young people into actually participating in weight loss/maintenance programmes (i.e. looking and feeling good, socializing and having fun). This may in turn help them to lead to healthier lifestyles with psychological benefits of feeling/looking good alongside the ultimate long-term health benefits.

Conflict of interest statement

There are no conflicts of interests.

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Appendix 1: Search strategy for medline

1. exp Randomized Controlled Trials/
2. randomized controlled trial.pt.
3. controlled clinical trial.pt.
4. exp Random Allocation/
5. exp Double-Blind Method/
6. exp Single-Blind Method/
7. or/1–6
8. exp 'Clinical Trial [Publication Type]'/

9. clinical trial.pt.
10. (clin$ adj25 trial$).ti,ab.
11. ((singl$ or doubl$ or trebl$ or trip$) adj25 (blind$ or mask$)).ti,ab.
12. placebos.sh.
13. placebo$.ti,ab.
14. random$.ti,ab.
15. exp Research Design/
16. research design.sh.
17. or/8–16
18. exp Intervention Studies/
19. 7 or 17 or 18
20. exp Obesity/
21. obese$.mp.
22. exp Overweight/
23. overweight$.mp.
24. or/20–23
25. (weight adj1 (loss or maint$ or reduc$ or control$) adj25 intervention$).tw.
26. (diet$ adj5 intervention$).tw.
27. (physical adj1 activit$ adj5 intervention$).tw.
28. exp Life Style/
29. ((lifestyle or life-style or life style) adj5 intervention$).tw.
30. exp Exercise/
31. (exercise$ adj5 intervention$).tw.
32. ((behaviour$ or behavior$) adj5 intervention$).tw.
33. or/25–32
34. 19 and 24 and 33
35. exp Pharmaceutical Preparations/
36. (drug$ adj5 intervention$).tw.
37. exp Bariatric Surgery/or exp Surgery/
38. (surg$ adj5 intervention$).tw.
39. Prader-Willi Syndrome/or Obesity Hypoventilation Syndrome/or Polycystic Ovary Syndrome/or Acquired Immunodeficiency Syndrome/or Syndrome/or Nephrotic Syndrome/or Cushing Syndrome/
40. syndrome$.tw.
41. exp Contraceptives, Oral/
42. Leukemia/
43. (leukaemia$ or leukemia$).tw.
44. exp Neoplasms/
45. cancer$.tw.
46. exp Epilepsy/
47. exp Cystic Fibrosis/
48. exp Eating Disorders/
49. exp Anorexia Nervosa/or exp Anorexia/
50. exp Bulimia Nervosa/or exp Bulimia/
51. Anorexia.mp.
52. bulimia.mp.
53. (eating adj1 disorder$).mp.
54. or/35–53
55. 34 not 54
56. limit 55 to ('adolescent (13 to 18 years)' or 'adult (19 to 44 years)')
57. limit 56 to yr = '1980–2006'

ABSTRACT PRESENTED AT 17TH EUROPEAN CONGRESS ON OBESITY-PUBLISHED IN OBESITY FACTS 2009; 2 (SUPPLE 2): 72

Validation of self-reported body mass index based in 11-18 year olds and a group of 18-25 University students - results from North East Scotland

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Introduction: Often the only practical means of collecting weight and height information from large samples is by self-reported values via questionnaires. The aim of this paper is to assess the impact that such self reported values have on body mass index for two age groups, 11-18 and 18-25 year old.

Methods: A sub-sample from a school based survey of 11–18 year olds resident in Northeast Scotland gave information on self reported and anthropometric height and weight measurements. Independently, consenting students aged 18-25 from the University of Aberdeen also had their self reported and anthropometric measurements recorded.

Results: From 1394 schools participants in the age group 11-18 years, n=366 had self and actual measures for height and weight. The University sample had 192 participants in the 18-25 year old age group of whom 182 had self and actual height and weight measures. Both age groups revealed a small under-reporting of body weight. Height was slightly over estimated but only by men in the older age group. These biases resulted in minor under-reporting of body mass index (BMI) of 0.78 kg/m^2 for boys and 1.02 kg/m^2 for girls in the 11-18 year age group and 0.80 kg/m^2 for men and 0.37 kg/m^2 for women in the18-25 year old age group.

Conclusions: Both studies show that most young people regardless of age tend to under represent their weight and that young men might slightly overestimate their height. However the overall impact on BMI is minimal.

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