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**PHD**

**Maintaining adolescents' involvement in exercise and quality of life  
A Self Determination Theory approach**

Gillison, Fiona

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# Maintaining adolescents' involvement in exercise and quality of life: A Self-Determination Theory approach

Volume 1 of 1

**Fiona Bridget Gillison**

A thesis submitted for the degree of Doctor of Philosophy

University of Bath  
School for Health

April 2007

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Adolescence is a time during which physical activity is reported to decline steeply, putting both current and future health and well-being at risk. The four studies included in this thesis were designed to contribute to our understanding of why participation in leisure-time exercise declines during adolescence. In particular, the studies aimed to test a proposed pathway of effects between negative body or weight-related self-perceptions and engagement in volitional exercise through the application of self-determination theory (SDT; Deci & Ryan, 2000). The roles of extrinsic goal content, need satisfaction and motivation on leisure-time exercise (LTE) were tested at both a cross-sectional and longitudinal level, and analysed in detail through a qualitative study. A final experimental study was then conducted to test the degree to which some of these observed constructs are open to change, and to explore whether focusing adolescents on exercising for goals of physical appearance in a single exercise session (PE) would be facilitative of involvement in PE through heightening its relevance, or inhibitive of self-determined motivation through the pathway of effects predicted for extrinsic goals by SDT.

Weight-related physical self-perceptions (WR-PSPs) were found to compromise need satisfaction and motivation to predict poorer LTE and quality of life one year later, suggesting that the reduction of, or distraction from WR-PSPs would form a useful basis for exercise interventions. Adolescents showed resilience to extrinsic goals and motives for exercise, which were found to have a positive additive effect on behaviour, motivation and perceived value of activities when present in combination with intrinsic goals and motives for exercise. These findings indicated that a hierarchy of goals exists, such that goals for individual bouts of exercise are less important in determining the outcomes an adolescent will experience, than goals for exercise overall. The findings divert somewhat from SDT to suggest that when combined with a basis of intrinsic motivation towards exercise, the introduction of a highly relevant, yet extrinsic goals may be useful in initiating (although not necessarily maintaining) effortful goal directed behaviour in adolescence.

## List of commonly used abbreviations

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BMA	British Medical Association
CFA	Confirmatory factor analysis
DoH	Department of Health
HMIEM	Hierarchical Model of Intrinsic and Extrinsic Motivation
IPA	Interpretive Phenomenological Analysis
LTE	Leisure-time exercise
LTEQ	Leisure-time exercise questionnaire
PE	Physical education
QCA	Qualitative comparative analysis
QoL	Quality of life
SDT	Self-determination theory
SES	Socio-economic-status
SPA	Social physique anxiety
WHO	World Health Organisation
WHOQoL	World Health Organisation quality of life measure
WR-PSPs	Weight related physical self-perceptions



## Introduction

The study of behaviour change during adolescence is an exciting avenue for research, as it is a life transition during which individuals first really come to perceive themselves as unique individuals, distinct from their parents and friends, and begin to perceive the possibility, and even responsibility, to choose the life they want to lead (DiClemente, 1996). However, dealing with the many concurrent developmental changes of adolescence, and constructing a stable self-identity is a somewhat daunting task. As such, adolescence is commonly considered to be a period of experimentation, in which the emergence of problem behaviours, such as substance misuse or anti-social behaviour, are to some degree tolerated under the assumption that these things will change (Shelder & Block, 1990; Williams et al., 2002). If it is the case that much adolescent behaviour is experimental, then the outcomes to these experiments may be very important for determining future behaviour. As such, adolescence could represent a crucial time for intervention to promote the consolidation and perpetuation of more healthy behaviour.

An area of serious concern for adolescent health is the rising prevalence of obesity (Joint Health Surveys Unit, 2002; McCarthy et al., 2003). In recognition of the problem, the UK Government recently established a National Childhood Obesity Database (NCOD), working with schools and Primary Care Trusts to start recording the yearly prevalence of obesity using objective measures, based on an extensive sample of over half a million UK children. It is envisaged that this will provide a basis from which to monitor future trends, and to measure the impact of policy changes. In the first year of data collection (2005 to 2006), 15% of preadolescent (i.e., children age 10 and 11) girls and 19% of boys were estimated to be obese, and a further 14% of children of both sexes estimated to be overweight (Crowther et al., 2007). This compares to estimates of 8% and 6% obesity in same age girls and boys respectively, between 1995 and 1997 (Joint Health Survey's Unit, 1998). Changes in physical activity are considered to be significant contributors to the observed rise in obesity (e.g, Department of Health [DoH], 2004a; Yang et al., 2006). This rise in obesity is associated with a decrease in moderate and vigorous physical activity, and an increase in sedentary behaviour over this time (Biddle et al., 2004a).

Obesity and physical inactivity are not only problematic for an individual's physical health. Both factors are strongly associated with poorer adolescent mental health and psychological well-being (e.g., Berger, 2004; Eisenberg et al., 2003; Friedlander et al.,

2003; Steptoe et al., 1997; Wardle et al., 2006). For example, obesity can result in psychological distress as a result of weight based teasing or stigma (Eisenberg et al., 2003; Wang et al., 2004), it is associated with poorer physical self-perceptions such as self-esteem (Hesketh et al., 2004), and has been linked to a greater incidence of depression (Wardle et al., 2006). Physical activity, however, brings about a wealth of positive effects, not least protection against obesity (Simonen et al., 2004). Physical activity in adolescence is associated with positive well-being (Steptoe & Butler, 1996), lower levels of depression (Sallis et al., 2000), a lower frequency of health risk behaviours such as drug and alcohol abuse (Kirkcaldy et al., 2002), and enhanced physical self-perceptions (Neumark-Sztainer et al., 2003a). Therefore, independently of its relationship with obesity, the promotion of physical activity in adolescents is an important aim for the promotion of adolescent health in its widest sense.

Although adolescents can undoubtedly gain immediate health benefits from increased (or maintaining adequate) levels of physical activity (Hallal et al., 2006), the major lifestyle diseases with which it is associated such as heart disease, do not tend to emerge until adulthood (Department of Health [DoH], 2004a; Moore et al., 2003). However, there are other key reasons to justify why it is important to tackle change in physical activity during adolescence, beyond the prevention of disease in later life. First of all, adolescence is a key life transition at which time many lifelong habits and behaviour patterns are established, and as such there may be potential for intervention in order to increase the likelihood that regular physical activity is included among these persistent behaviours (Guo et al., 2000; Kvaavik et al., 2003; Tammelin et al., 2004). Most children are physically active when they enter adolescence, and exercise in general is almost universally enjoyed (Mulvihill et al., 2000). Secondly, interventions aiming to help sedentary adults to become regular exercisers have achieved only very modest success (Baranowski et al., 1998). This is perhaps not surprising as maintaining such a significant behavioural change requires time, effort, expense and often a shift in priorities to override established habits and change routine. Thus, we cannot rely on our ability to change behaviour later in life. From this standpoint, targeting individuals at a time when exercise is still an enjoyable part of life, and before lifetime activity habits are fully established may be a more realistic and achievable approach in promoting life-long physical activity.

However, adolescents experience increasing responsibilities for school work, household tasks, or part time jobs in addition to the developmental tasks of adjusting to puberty and developing a sense of identity. In this context, maintaining physical activity may not be a priority. Indeed, a recent report by the United Nations International Children's Emergency Fund (Unicef) assessing well-being in childhood and adolescence in developed countries reported that adolescents in the UK to have the poorest well-being of the 21 Western

nations assessed (Unicef, 2007). The indicators that contributed to this conclusion included high rates of health risk behaviours such as alcohol abuse, high rates of teenage pregnancy, a greater number of young people outside education and employment, high rates of bullying and poorer perceived support from peers. This report suggests that UK teenagers are struggling to achieve a healthy transition to adulthood, and highlights the potential difficulties of designing interventions to present physical activity as a pressing and relevant concern at this time. Thus, while adolescence may have been identified as a great opportunity for behavioural interventions, any attempt at changing behaviour at this time has to take place in competition with a host of other shifting activities and priorities.

To some degree, adolescents do not have a choice but to be physically active; they are required to take part in a minimum of two hours of PE at school, and may find themselves persuaded to take part in further activity outside school through parental or peer pressures (National PE school sport and club-links strategy, 2003). Psychological theories of motivation have much to contribute to our understanding of the outcomes that are expected to result from engaging in physical activity through lack of choice, both in terms of proximal issues such as effort and enjoyment, and longer term implications such as whether the individual decides to take part once the external controls are removed. One such theory is Self-Determination Theory (SDT; Deci & Ryan, 1985a; 1991). SDT proposes that motivation is the primary driving force of behaviour, and as such it is implied that behaviour change will be achieved through changing a person's motivation rather than through changing their attitudes or intentions, as is the focus of other psychological approaches (e.g., Social Cognitive Theory, Bandura, 1977; Theory of Planned Behaviour, Ajzen, 1985). Furthermore, SDT sets out that it is the quality, and not the quantity of motivation that is important in determining whether a person engages in an activity over the short or longer term (Ryan & Deci, 2002). Deci and Ryan refer to two distinct types of motivation. The first of these is *intrinsic motivation*, which describes the motivation behind activities that we need no encouragement to take part in, but do so purely out of the inherent pleasure they bring about. This may be for example from desire for a challenge or to have fun. The second type of regulation is *extrinsic motivation*, and encompasses a whole continuum of behaviours that stem from external controls, ranging from activities in which we take part in to avoid punishment (e.g., going to school), to those we willingly engage in as we have learned to value them (e.g., following moral principles).

From an SDT perspective, behaviour that is driven by the control of others is expected to result in lesser effort, enjoyment, well-being and interest in the short term, and lesser behavioural persistence and intention to continue in the long term. Thus, the likelihood of an adolescent staying active once they are free from school and parental controls is slim if their physical activity during their school years is largely maintained simply through doing

as they were told. Conversely, SDT predicts that activities emerging from more autonomous (internal) sources of motivation, which an individual considers to result from their own choice, are more likely to be repeated in the future. Such motivation is described as *self-determined*, and includes not only *intrinsic* motivation, but also forms of *extrinsic motivation* initially motivated by others but which have come to be personally endorsed (e.g., societal norms). SDT is a useful theory of motivation to apply to practical problems, as it outlines a series of psychosocial mediators and environmental conditions which can be manipulated to influence motivation, and thus predict behavioural, affective and cognitive consequences (Ryan & Deci, 2002). Furthermore, the constructs within SDT have been extensively operationalised by several decades of research to provide detailed examples of how the manipulation of environments to promote self-determined motivation can be achieved (Deci et al., 1994).

The current thesis is based on the premise that to increase self-determined motivation for exercise and rates of participation in adolescents, exercise needs to be presented as an activity that is relevant and consistent with their other priorities. One such major priority that has been identified in adolescence is physical appearance. As will be expanded later in the literature review, physical appearance and physical attractiveness are key contributors to achieving peer status and acceptance, which become increasingly important during adolescence for the development of a positive sense of global self-worth, self-esteem, and other positive self-perceptions (Craft et al., 2003; Horn & Weiss, 1991). Both older children and adolescents are often critically aware of societal body size ideals (Wardle et al., 2002), which are largely unrealistic for both boys and girls without considerable concentrated effort and discomfort (e.g., dieting to be slimmer, or weight training to become more muscular in boys; Cohane & Pope, 2001). It is no surprise therefore that levels of weight-related body satisfaction are low for adolescents of all sizes, and not just for those who are obese or overweight (Neumark-Sztainer et al., 2002). However, while in theory a physically active lifestyle can contribute to improving or maintaining body shape in the long term and thus would appear to provide a useful coping behaviour for those with poor body image, exercise contexts can also inadvertently heighten awareness of body related anxiety, and promote inter-personal comparisons which may exacerbate the problem. This may be through their very nature which focuses attention on the body, or other environmental factors such as requiring adolescents to wear PE kit that they consider to be too revealing. Indeed, rather than activating adolescents to exercise in order to achieve their ideals, research suggests that negative self-perceptions deter adolescents from exercising (Neumark-Sztainer et al., 2006).

The research question that forms the basis for the current thesis arises from the recognition of the increase in importance attributed by adolescents to physical



appearance through its associations with peer acceptance, and the possible link to the decline in physical activity at this time. Drawing from SDT, a first question arises as to whether exercising for purposes of improving body image or weight control is perceived to stem from controlling or autonomous motives. In line with theory, appearance-related motives would be expected to emanate from controlling sources (for example pressure from society as a whole, or from significant others from whom one seeks approval) and therefore compromise self-determined motivation. In this case adolescents who address poor weight-related physical self-perceptions through taking part in, rather than avoiding exercise, would be expected to experience negative motivational consequences. However, it may alternatively be the case that when appearance is considered to be personally important, exercising for this reason may be perceived autonomously. If this were the case, motivation would be more self-determined, resulting in far more positive behavioural, cognitive and affective outcomes.

In addressing these questions, the studies presented in the present thesis aim to explore the relationship between naturally occurring weight-related physical self-perceptions (WR-PSPs) and exercise in adolescents. They then aim to extend this observational work to test whether weight-related goals can be promoted or diminished by the social exercise environment, and to observe what the outcomes of these changes would be. Leisure-time exercise, as opposed to overall physical activity is chosen as the outcome of interest for this research, as it represents a volitional and purposeful part of physical activity which is recognised to be of importance to health (DoH, 2004b), and which represents a set of activities for which specific motivation can be measured (e.g., Chatzisarantis et al., 1997; Hagger et al., 2005). In taking a holistic approach to health, the outcome of associations between weight-related physical self-perceptions and motivation on an adolescents' quality of life (QoL) will also be measured. All the investigations will be grounded in SDT, to provide a systematic theoretically based approach, which will allow the research design to build on previous work, and the findings to be viewed in relation to wider theoretical implications.

Study 1 (Chapter 3) aims to establish the tenability of the relationship between the psychosocial mediators of motivation as set out by SDT and QoL over a period of change (school transition). Study 2 (Chapters 4 to 6) sets out to explore the cross-sectional and longitudinal associations between weight-related physical self-perceptions, leisure time exercise and QoL, mediated through the psychosocial constructs proposed by SDT. Incorporated in this work is a detailed analysis of change in self-reported QoL over a one year period. This was conducted to explore the stability of importance ratings of the constituent domains of QoL, which may be indicative of a change in adolescents' goals and priorities. Such goal and priority shifts in adolescence are central assumptions in the

approach to explaining behaviour change taken in this thesis. Study 3 (Chapter 7) presents a qualitative study exploring factors that adolescents consider to underlie their motivation for exercise, and how they attempt to integrate their own reasons for participation with those advanced by others. Study 4 (Chapter 8) presents a test of the degree to which weight and physical appearance-related reasons for exercise can be manipulated in the short term, assessing the consequences of each for the experience of exercise, the effort expended in taking part, and intentions to engage in similar exercise sessions in the future. The findings of all studies will be drawn together to discuss their implications for all those involved and interested in promoting exercise in adolescence, and suggested directions for future research.

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# LITERATURE REVIEW

## Section 1: Physical Activity in Adolescence: Its Importance and Current Trends

### 2.1.1 *Physical Activity in Adolescence*

Physical activity can be defined as "any force exerted by skeletal muscle that results in energy expenditure above resting level" and includes "the full range of human movement, from competitive sport and exercise to active hobbies, walking and cycling or activities of daily living" (DoH, 2004, p81). Within this broad definition, exercise encompasses the subgroup of physical activities which are undertaken with the aim of achieving a beneficial level of fitness and health, both physically and mentally. Thus, exercise is undertaken with the express aim of being active, whereas physical activity can occur incidentally, while setting out to achieve other aims (e.g., housework, commuting). The clarification between the two is important, as the factors that have been found to influence physical activity and exercise differ (e.g., Lustyk et al., 2004). As such, interventions which succeed in increasing daily physical activity are likely to differ from those expected to increase bouts of moderate or vigorous activity (Biddle et al., 2004b).

A further differentiation should be made between physical activity and sedentary behaviour. Rather than purely representing the opposite end of the exercise spectrum, sedentary behaviour has been found to have only a limited relationship with the amount of exercise a person takes (e.g., Utter et al., 2003; Biddle et al., 2004a). A recent meta-analysis incorporating 52 studies reported sedentary behaviour to have only a small relationship (i.e., effect size < .2) with either body fatness or physical activity (Marshall et al., 2004). Sedentary pursuits such as TV viewing and computer games can be equally common among active and inactive children and adolescents, often taking place at different times of day than those in which the majority of active pursuits are undertaken (Prochaska et al., 2000; Trost et al., 2001; Prochaska et al., 2003). This indicates that there is time for both in a child or adolescent's day (Biddle et al., 2004a). Indeed it is suggested that the real threats to child and adolescent activity are not the increasing availability of sedentary leisure pursuits such as television viewing or computer games, but lifestyle changes such as the reduction in the proportion of children walking to school

(Cooper et al., 2003; Biddle et al., 2004a). Overall, the current decline in physical activity in the UK is seen as a combination of change in all three types of behaviour.

Declining physical activity levels within Britain are an increasing problem for current adolescent health, and for the future health of adolescents (DoH, 2004a). Current government guidelines recommend that “children and young people do at least 60 minutes of at least moderate intensity physical activity each day. At least twice a week this should include activities to improve bone health, muscle strength, and flexibility” (DoH, 2004b, p21). Recent estimates suggest that 75% of 11 year old boys and 52% of girls are sufficiently active for health in the UK, and while boys are more likely to maintain exercise levels with 71% still classed as sufficiently active by the age of 15, this deteriorates to just 36% in girls (Thompson et al., 2003a; Biddle et al., 2004a; DoH, 2004b). However, activity levels in boys take a similar downward trend later on in adolescence, and by young adulthood (ages 24 to 35), only 35% of females and 58% of males are considered sufficiently active for health (DoH, 2004a). A similar pattern is seen in other Western countries such as the US, where a decrease in exercise of all intensities and an increase in sedentary behaviour has been reported (Caspersen et al., 2000). In this cohort of 10,000 young people aged from 12 to 21, all activity markers decreased as age increased, but the rate of decline was at its steepest between the ages of 15 and 18. Boys were more active than girls at most time-points, and in most types of activity (e.g., light or strenuous), however the pattern of change was similar across gender. A similar decline in physical activity has been observed in European children, this time measured through objective measures of physical activity from the age of 9 to 15 (Riddoch et al., 2004).

Not only do adolescents generally take part in less exercise than they did as children, but the pattern in which they exercise is also very different. Younger children get exercise through frequent short bouts of activity, often as part of spontaneous play and purely for the sake of enjoyment (Gavarry et al., 2003; Prochaska et al., 2003). Adolescents however, begin to exercise in a more adult pattern, which involves low intensity exercise in carrying out the activities of daily living, with moderate to vigorous exercise only carried out in discrete purposeful bouts in a sport or exercise setting (Joint Health Survey's Unit, 1998). The change to adult-like patterns begins to emerge during puberty, however the evidence that the change is due to the physical or psychological associates of maturation is contradictory. In a review of research findings reported in 1996, physical activity was found to be negatively associated with maturation status, and the timing of the initial drop in exercise levels to coincide closely with puberty; at around 13 for girls, and 15 for boys (Graber et al., 1996b). This was interpreted to imply that the explanation for gender differences in the age of the steepest decline in exercise rates may reside simply in the earlier onset of puberty in girls. However, more recent work with a sample of eighty-three

10-15 year olds which combined the longitudinal assessment (over one year) of physical activity, with measurement of changes in body fat (measured through objective indicators) and self-reported pubertal status found no such result (Murdey et al., 2005). While a higher maturation status indicated greater sedentary behaviour on weekdays in boys, and higher percentage body fat (independent of maturation status) was associated with sedentary behaviour at weekends for girls, no significant associations were found between body composition, pubertal status and overall body satisfaction for either gender. However, regardless of the origin of the decline in physical activity at around the age of puberty, adolescents are very aware of the change in their activity levels, and qualitative research suggests that this is attributed by the teenagers themselves to be at least in part due to greater body related concerns (Mulvihill et al., 2000).

Whatever an adolescent's attitudes towards physical activity, all UK schools are required to contribute to Government activity targets by providing at least two hours of weekly high quality physical education (PE) for all students under the age of 16 (Biddle et al., 1998; National PE, school sport and club-links strategy, 2003). However, while lessons may well last for this recommended period of time, only a proportion is actually spent in physical activity (Macfarlane & Kwong, 2003). Observational studies of PE lessons estimate that an average of 12-15% of the lesson is spent in vigorous activity, and 37% in moderate activity (Barnett et al., 2002; Friedman et al., 2003) equating to 8 minutes of vigorous, and 22 minutes of moderate exercise in any hour long lesson. Directly observed studies have reported this to be even lower in some cases, for example on occasions when teachers are disorganised just 7-10% of the time can be spent in vigorous activity (Tzetzis et al., 2003). It can be seen that the physical activity provided by PE falls far short of Government guidelines, and that if adolescents are to reach the levels suggested, then the majority of their physical activity needs to take place outside structured school lessons (Fox, 2003; DoH, 2004b). This is not to suggest that the quality or contribution of PE is not still very important, however. Not least as illustrated in a study of 3211 adolescents aged from 11 to 18 in Northern Ireland, one third of girls were found not to take any physical activity outside PE lessons (Riddoch et al., 1991). This reflects other findings from 1990 reporting that some 23% of 11 year old boys, and 35% of girls reported taking no exercise at the weekend (Wardle & Marsland, 1990), figures which may well have increased significantly over the past 17 years.

### ***2.1.2 Health Implications of Activity and Inactivity***

Physical activity during adolescence has a multifaceted impact on both current and future health (Hallal et al., 2006). Firstly, during childhood and adolescence itself physical activity is associated with better bone health (Arluk et al., 2003), better markers of cardiovascular health (Tolfrey et al., 2000), fewer reported sick days (Cieslak et al., 2003),

and better psychological well-being (Norris et al., 1992; Janssen et al., 2004). Inactivity (Janssen et al., 2004) and the lack of vigorous activity (Patrick et al., 2004b) are both associated with an increased risk of obesity, and inactivity is additionally associated with poorer physiological risk markers for cardiovascular disease (Dietz, 2004). As some of the negative effects of inactivity take time to accrue, they may not emerge until later in life, and therefore adolescent inactivity is also linked to increased risk factors for coronary artery disease in adulthood, and the accumulation of insufficient bone mass for adult bone health (Boreham & Riddoch, 2001). A further means in which adolescent physical activity could influence adult health is if activity patterns track into adulthood. While sedentary adolescents invariably go on to become sedentary adults, it appears that there is greater variability in reports of the tracking of positive activity levels (Thompson et al., 2003b; Tammelin et al., 2004). A recent systematic review of studies tracking physical activity levels from adolescence to adulthood reported a consistent, although moderate effect of adolescent physical activity levels on physical activity in adulthood, although the reliability of this relationship varied as a result of factors such as socio-economic status (SES) and methodological approach (Hallal et al., 2006). Lifetime physical inactivity has been closely linked to lifestyle diseases such as cardiovascular disease, diabetes, some forms of cancer, and obesity (DoH, 2004).

### ***2.1.3 Measuring Physical Activity and Exercise in Adolescence***

Much of the difficulty in assessing the strength and validity of evidence in physical activity research relates to differences in the way it is measured. While objective indicators are generally considered to be more accurate than self-report measures, they are not immune from inaccuracy due to methodological inconsistencies such as the number of days of data collected, whether or not equipment is open to view, and equipment tampering. Objective measures are also not always appropriate for large scale epidemiological work, smaller budget research, or studies for which physical activity is not the major outcome of interest (e.g., it is often one of many indicators considered in obesity prevention research, cf. Summerbell et al., 2005). In such cases self-report measures are much more common. There is often considerable discrepancy in the agreement between the results reported by different instruments when validated against each other (e.g., Kowalski et al., 1997; Kohl et al., 2000), however, this may be as much attributable to what each instrument is attempting to measure than to differences in accuracy. For example, some instruments provide estimates of total energy expenditure, others estimate daily physical activity, and others report the frequency of exercise at different intensities. A brief description of the advantages and disadvantages of self-report measures as to be used in the present thesis is presented below, and a summary of the alternative methodologies provided in the Appendix, section 2.1.

### 2.1.3.1 Self-report measures

Self-report questionnaires are the most practical instrument for large sample sizes, as they are cheap and simple to apply. Subsequently they are the most widely used method of estimating activity levels in children and adolescents (Dishman et al., 2001; Armstrong & Welsman, 2006). Self-report measures also allow researchers to obtain greater information regarding their area of focus, such as the intensity, duration, and the environment in which physical activity takes place. However, this detail comes at the cost of being significantly less accurate than the majority of objective measures. Self-report measures are open to social desirability and recall bias, memory limitations (Baranowski, 1988), and are less sensitive to change than objective measures (Sallis & Saelens, 2000; Shephard, 2003; Armstrong & Welsman, 2006).

Considerable variation has been reported in the correlation between different self-report measures, and between self-report and objective measures (Kowalski et al., 1997; Marcoux et al, 1999; Janz et al, 1995). For example, Epstein et al (Epstein et al., 1996) found only a moderate correlation ( $r = .46$ ) between a self-report diary of exercise and accelerometer data in a sample of obese children. However, support for the validity of both measures was reported, as accelerometer data predicted expected differences in physical activity according to socio economic status (SES) and parent activity level, whereas self-report measures were predictive of fitness levels. Differences in the concurrent validity of self-report and objective measures for estimating different types or intensities of activity (e.g., vigorous, moderate, or strength and flexibility) are commonly reported when comparing the same instruments (e.g., Prochaska et al., 2003). This suggests that the differences between objective and self-report measures are not purely due to greater inaccuracy in the latter, but also reflect differences in accuracy according to exactly what is being measured. Self-report measures are recognised to differ in their reliability in measuring activities of different intensities. For example, the Leisure Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985) is reported to show significantly stronger test-retest reliability for vigorous than for low intensity exercise (Eisenmann et al., 2002), and the three day physical activity recall (3DPAR) is reported to be more strongly correlated with total and vigorous physical activity than with moderate intensity exercise (Pate et al., 2003). These findings emphasise the importance of selecting an appropriate measure for the purpose of an intervention to minimise avoidable inaccuracy (Sarkin et al., 2000; Rzewnicki et al., 2003).

The majority of self-report measures have poorer accuracy for younger age groups (Sallis et al., 1993; Booth et al., 2001). This is in part due to children's lesser cognitive capacity than adults, as they are less able to estimate the duration of activity, or to remember activity taken over previous days or weeks (Janz et al., 1995). Given than many

measures require respondents to list only bouts of exercise over 10 or 15 minutes in duration, children's activity may not be captured by adult measures as it tends to occur in sporadic, short episodes (Troost et al., 2001; Marshall et al., 2004; Armstrong & Welsman, 2006). Over-reporting by children to the degree of 14-20% has been detected using some adult measures when compared with interview data collected immediately after questionnaire completion (Rzewnicki et al., 2003). The intensity of exercise measured may also affect the accuracy of self-report tools in children and adolescents, as vigorous activity is considered to be significantly over-reported (Sallis & Saelens, 2000), while moderate intensity exercise may be underestimated (Armstrong & Welsman, 2006). However, the population of interest to the present thesis is mid-adolescents (i.e., 13-15 year olds), and for this age group the reliability of self-report measures has been found to approach that of adults (Sallis et al., 1993).

Thus, despite the potential pitfalls of self-report data, measures designed or adapted for children and adolescents are available and have been found to be reliable, with 17 acceptable instruments identified by the year 2000 (Sallis et al., 1993; Sallis & Saelens, 2000). Sallis et al. (1993) compared three self-report measures in adolescents (the LTEQ, the 7 day physical activity recall, and a simple activity rating), finding them all to have adequate test-retest reliability (.77 to .93) which improved with age (from 10 to 16). Greater reliability can be achieved through ensuring that the time period between the activity and self-report is short (Pate, 1993), or if possible that physical activity is recorded on a daily basis (Weston et al., 1997).

#### **2.1.4 Summary**

This section has aimed to provide evidence that physical activity levels in adolescence are declining, and that this is important for individual and population level health. Research concurs that while girls' activity levels decrease significantly from around the age of 13 or 14, boys tend to remain active during this period, but experience a decline later in adolescence (Riddoch et al., 1991; Caspersen et al., 2000). In considering why this occurs, it could be useful to consider what else changes for adolescents at about this time, and as such it is of note that the ages of steepest decline align quite closely with the onset of puberty (Graber et al., 1996a), suggesting some association with developmental processes, be they biological, social or environmental (DiClemente, 1996). This period of mid-adolescence is associated with changes in other behaviours, for example the emergence of health risk behaviours (DiClemente, 1996), and therefore consideration of the wider context of adolescence may provide insight into the particular behaviour change of declining physical activity.



## **Section 2: The Context of Adolescence**

Adolescence describes the transition period between child and adulthood, encompassing some of the most striking biological, social and psychological changes of the human lifespan (Williams et al., 2002). The start and end points of adolescence are largely socially prescribed, as there is considerable variation between cultures dependent on the age at which young people are expected to establish financial independence. The World Health Organisation (WHO) defines adolescence as the period of life between the ages of 10 and 19 (Goodburn & Ross, 1995), which is reflected in the UK by the British Medical Association classification which spans from 11 and 19 years (BMA, 2003). Adolescence poses very different challenges to health than at other times during the lifespan, as while adolescents have lower rates of disease and illness than young or old populations (Roberts, 1995), it is a time during which the greatest threats to mortality and morbidity come from avoidable behaviours (DiClemente, 1996). This is due to the emergence of so called 'risk-taking behaviours', which are characterised as being volitional, and of uncertain outcome, but which put an individual's current or future health at risk. Risk-taking behaviours include drug taking, alcohol use, smoking, risky sexual activity, suicidal behaviour, and behaviours that lead to unintentional injuries (e.g., car accidents through dangerous driving, Patrick et al., 1997; Resnick et al., 1997). Adolescence is also a time of the onset of some major mental health problems, such as depression and anxiety disorders, which may not have a behavioural root, but can be masked by the use of externalising coping behaviours, such as alcohol and drug use (Williams et al., 2002). Therefore even if the cause is not attributable to behaviour, risk-taking behaviours can postpone the onset of diagnosis and treatment.

But why do such drastic behavioural changes occur? One view is that risk-taking behaviours emerge as a way of coping with the major developmental tasks of adolescence. DiClemente (1996) presents a framework detailing how these numerous tasks and challenges interact, relating the primary developmental changes of puberty to the outcomes of adolescent adjustment which can be both confined and promoted by the social and cultural environment (see Appendix, 2.2). The model suggests that the normative biological, cognitive, and social role changes of puberty initiate a process of change in other domains, including family and peer relationships and school life, which force the adolescent to accept and adapt to the onset of their transition to adulthood. Change in each of the domains of life influence how and when they are able to achieve the developmental tasks of adolescence, such as the establishment of autonomy, identity and intimacy, through a process of psychological adjustment. This process is further moderated by the environment in which these changes take place, such as family structure, ethnicity, gender and SES.

### **2.2.1 Adolescent Cognitive Development**

The concurrent completion of cognitive development during mid-adolescence provides individuals with greater capacities for understanding both the thoughts and feelings of others, and to more critically observe their own thoughts and actions. As a result they become more self aware and self critical (Tinsley, 2003). Prior to this point, during childhood and early adolescence (i.e, up to the age of 11 or 12) self evaluations are limited by cognitive development (Harter, 1998). Children are unable to reconcile different attributes of the self, such as their different roles or their performance in different domains, which makes them prone to overgeneralisations that fluctuate in line with their current setting. This failure to integrate self-attributes makes them unable to develop a stable sense of self-worth (Roberts, 1995). During middle adolescence (ages 12-16), adolescents become able to recognise that negative and positive attributions can exist simultaneously. However as these attributions are not yet fully integrated, this can sometimes lead to conflict and confusion rather than a greater self understanding. The increasing cognitive capacities of mid-adolescence however, enable individuals to begin to engage in normative peer comparisons, allowing them to draw on a wider pool of information than was possible in childhood in integrating their various self-attributions. Increasing weight is placed on the information provided by peers, or obtained from peer comparisons in making self-judgements of personal competence and self-worth (Horn & Weiss, 1991; Craft et al., 2003). It is this period of mid-adolescence that coincides with the observed decline in physical activity in girls, and which leads to the onset of a steeper decline in activity in adolescent boys.

Given that for many mid-adolescents the integration of self-attributions is not yet complete, the pressure to develop different selves in different roles and relationships and yet still feel part of the same 'self' can pose a considerable challenge. One result of this is reported to be a significant pre-occupation with controlling how one appears to others (Roberts, 1995). Thus, presenting a consistent and desirable self to others becomes a major focus for adolescents during this time. It is not until late adolescence (i.e., after 16) that adolescents are able to integrate their different self-attributions to form a more stable sense of self, and become less reliant on constant feedback from others, and on monitoring their own self-presentation (Harter, 1998).

### **2.2.2 The Impact of the Social Environment**

Social role changes also accompany biological maturity and the completion of cognitive development, as adolescents start to be treated less like children and more like adults. Indeed, the social environment during adolescence is highly predictive of adjustment (Roberts, 1995; DiClemente, 1996). Changes occur in interpersonal relationships across contexts such as the family, peers, and school, moderated through broader cultural level

factors such as gender, ethnicity, and SES (DiClemente, 1996). Parental relationships are still very important during adolescence (Harter, 1998), although they differ in their quality from childhood as other significant relationships are formed (e.g., with peers or romantic partners). For example, an authoritative parenting style, whereby clear rules are provided, but these are discussed and negotiated, is associated with lower rates of risk taking behaviours and higher self esteem in adolescence than either permissive parenting styles (i.e., absence of boundaries) or authoritarian relationships (i.e., over-dominant, lacking in support for autonomy, Petito & Cummins, 2000). Peer influence peaks in mid-adolescence at around the age of 15, however, adolescents who perceive their parents as more involved in their lives and more understanding, are less susceptible (Berndt, 1996; Eccles et al., 1996). Parental approval and acceptance is a significant predictor of self-esteem on into young adulthood even after leaving home (Harter, 1998). Thus, while adolescents might be struggling to obtain a greater sense of autonomy and break away from parents, they are better adjusted if their parents remain involved, even if involvement increases conflict (Petito & Cummins, 2000).

In practical terms, peers can have a very positive effect on engagement in physical activity, and its enjoyment. Having friends to exercise with is a significant predictor of high levels of physical activity (Allen, 2003; Craft et al., 2003; Stahl et al., 2001) whereas perceiving a lack of friends who exercise regularly is associated with lower levels of exercise participation (Mulvihill et al., 2000; Vilhjalmsson & Kristjansdottir, 2003). Similarly, motivation for exercise is positively predicted by perceiving it to be an opportunity to make friends, to obtain social validation (i.e. feeling part of a crowd), or obtain social recognition (relating to peer judgements of competence) (Allen, 2003). Taking part in organised sports clubs and teams is reported to increase adolescents' feelings of school engagement and connectedness, that is the degree to which an individual feels attached to their school, feels that they fit in, and that others at school are sympathetic towards them (McNeely et al., 2002; Libbey, 2004). The subjective marker of school connectedness, and being engaged in school measured through objective indicators such as taking part in sports clubs and teams, are both associated with lower rates of suicidal behaviour and emotional distress (Harrison & Narayan, 2003), and a decreased risk of engaging in health risk behaviours such as drug and alcohol use (Libbey, 2004; Murphey et al., 2004; Fredricks & Eccles, 2006). A positive social norm for exercise is also reported to have small additional effect on exercise levels beyond that of having friends within a close social network with whom to exercise (Saunders et al, 2004). Thus, in addition to improving physical health, enhancing opportunities for engagement in physical activity in friendship groups, boosting school engagement and connectedness and attempting to foster a social norm of exercise within school could all also benefit adolescent mental health, adjustment and achievement.

Peer relationships become increasingly important as adolescents come to rely less on their parents for information regarding their self-identity, as it is from these relationships that much information regarding self-attributions such as a sense of identity and value is drawn (Horn & Weiss, 1991; Moshman, 1999; Baker et al., 2003; Craft et al., 2003; Smith, 2003). Peer acceptance is reported to be positively predictive of high self-esteem (Harter, 1998), and a global sense self-worth (Craft et al., 2003). In this context the attainment of acceptance and status are therefore highly prized. Failure to gain acceptance from the dominant social group is closely associated with negative evaluations of physical self-worth, and predictive of delinquent behaviour, as adolescents attempt to boost their self-esteem by seeking alternative sub-groups through whom they may seek approval (Harter, 1998). Research concurs that judgements of social status and peer acceptance in adolescents are overtly based on physical attractiveness and athletic competence (Craft et al., 2003; Robbins et al., 2004b; Smith, 2003). Indeed, both subjectively and objectively measured physical competence have been shown to be positively related to subjectively and objectively measured social acceptance (Weiss & Duncan, 1992). Therefore in order to obtain peer acceptance and approval, adolescents develop strong goals for presenting a physically attractive image, and demonstrating physical competence.

The increasing focus on physical appearance and competence may have complex effects on engagement in physical activity. From one perspective physical competence is demonstrated through taking part in sport and exercise, but from another it can be an arena which demonstrates the lack of competence in those who do not excel (Sallis et al., 2000). Similarly, while over the long term exercise may tone the body and prevent weight gain which is associated with physical attractiveness (Harter, 1998), in the short term taking part in exercise removes some of the control a person has over their appearance, for example in making one sweat (Mulvihill et al., 2000).

### **2.2.3 *Physical Self-Perceptions and Exercise***

The increasing frequency of inter-personal comparisons during adolescence, and the increased focus on physical attractiveness, are linked to a greater degree of self-objectification, especially in girls (Strelan et al., 2003). Body dissatisfaction (whether at being under or overweight) is considered to be common in both boys and girls throughout adolescence, and is associated with psychological distress (Kostanski & Gullone, 1998; Cohane & Pope, 2001). Estimates of the prevalence of body dissatisfaction vary according to how it is measured. For example, in a sample of 496 adolescent girls in the US (aged 11-15) 24% were estimated to experience body dissatisfaction (Stice & Whitenton, 2002) whereas other reports have rated it as high as 80% in girls and 31% in boys (Cohane & Pope, 2001). In the former case the lower rates were obtained by direct

questioning measures (e.g., “how satisfied are you with your weight?”; Stice & Whitenton, 2002), whereas the higher rates from the latter study were obtained by comparing perceptions of actual and ideal body shape on a pictorial scale (Kostanski & Gullone, 1998). This discrepancy suggests that perhaps of those who perceive a difference in their actual body size and what size they would ideally like to be, only a proportion are unduly concerned. But whatever the prevalence, rather than encouraging healthy reparative behaviours such as increased physical activity, body dissatisfaction is predictive of behaviours that increase the likelihood of further weight gain, or put the individual’s health at further risk (Neumark-Sztainer et al., 2006). For example, in a five year study relating body satisfaction to weight control behaviours from the ages of 12 to 17 in over 2000 students in the USA, poor body satisfaction (controlling for BMI) positively predicted higher levels of dieting and unhealthy weight control behaviours in girls (e.g., fasting, use of food substitutes), but lower levels of moderate to vigorous exercise (Neumark-Sztainer et al., 2006). Similar patterns emerged in boys, with low body satisfaction positively predicting lower exercise rates. Thus, body dissatisfaction is an important consideration in adolescent physical activity and exercise levels, as it can be a significant deterrent to taking part.

A further self-perception that is common in adolescents is social physique anxiety (SPA). SPA stems from concern that one’s figure is being negatively evaluated by others in social settings (Hart et al., 1989; Crawford & Eklund, 1994), and represents a subtype of social anxiety relating to self-presentational concerns about one’s appearance (Brewer et al., 2004; Raedeke et al., in press). The prevalence of SPA during adolescence may reflect that a large proportion of physical activity takes place in school or social settings with peers, at a time where peer acceptance and status is perceived to be very important (Smith, 2003). Regardless of objective measures of weight status, a greater degree of SPA is positively associated with peer rejection (Smith, 2004). In adults, SPA has been linked more extrinsic (maladaptive) reasons for exercise which predict poorer long term participation rates, and lower levels of enjoyment (Frederick & Morrison, 1996; Raedeke et al., in press). In a recent qualitative study of adolescents’ coping strategies to deal with SPA (Sabiston et al., 2007), the most common strategies reported were exercise avoidance tactics (e.g., obtaining notes from parents to avoid PE), and reparative appearance management (e.g., wearing cover-up clothing). However, while a small proportion of participants reported using exercise to address their SPA, few of those who identified exercise as a means to enhance body shape and thus theoretically to reduce SPA reported actually using it themselves. Those who did typically took part in intense and sporadic ways (e.g. 50 to 200 sit-ups to work off junk food) rather than through regular involvement in healthy exercise (Sabiston et al., 2007). Thus, SPA provides a

means of measuring one of the ways in which body dissatisfaction manifests itself in a social setting, and which links to exercise behaviour and cognitions.

#### **2.2.4 Health Behaviours in Adolescence**

The cognitive and social changes of mid-adolescence provide a background to suggest why behaviour, and in particular health risk behaviours, change during this time. Psychologists argue that the emergence of health risk behaviours should not be seen as arbitrary acts of rebellion, or to result from a lack of ability to perceive future consequences, but instead represent purposeful, meaningful, goal-oriented and functional behaviours, that may fulfil an adolescent's need for autonomy, initiative taking, mastery and intimacy (DiClemente, 1996). Previous research conducted on a number of risky health behaviours supports this assumption, suggesting that risk-taking behaviours are determined by an individual's personal goals (Spruijt-Metz et al., 2004; Henson et al., 2006). For example, differences in goals may be predictive of the development of risk-taking behaviours, as having a future time perspective (i.e., perceiving future consequences in current actions) is found to be protective of health by reducing the occurrence of risky health behaviours that could put future achievement at risk (e.g., drinking on school nights is incompatible with the completion of schoolwork necessary to gain a place at University) (Henson et al., 2006). While in general frequently occurring health risk behaviours are associated with poorer life satisfaction (Zullig et al., 2001), studies have shown that some experimentation with risky behaviours (e.g., trying illegal substances without becoming a heavy user) may be adaptive through helping adolescents to attain the developmental goals of independence, autonomy and mastery (e.g., Shelder & Block, 1990).

Considered alongside more dramatic threats to adolescent health such as drug use and risky sexual practice, changes in physical activity may appear to pose less of a threat to adolescent health and well-being. However, in countries such as the United Kingdom (UK) where obesity in both adults and children is now considered to be reaching epidemic proportions (Branca et al., 2006), declining physical activity is a very serious threat to public health (DoH, 2004). If it is the case, as argued here that health risk behaviours are goal directed and fulfil useful functions for adolescents, then it may also be the case that the health behaviour of physical activity declines during this time either because it does not fulfil the individual's goals, or because it is incompatible with the achievement of their new goals. In addressing this possibility, the next step is to consider what adolescents' goals are for taking part in sport and exercise.

#### **2.2.5 Exercise Goals**

Adolescents perceive and acknowledge many benefits of exercise (e.g., Deforche et al., 2004), however it is important to distinguish between the potential reasons for taking part

that can be identified, and a person's own goals for doing so. Previous research indicates such differentiations may be important, as recognising a role for exercise in bringing about improvements related to body image (Cheng et al., 2003), or SPA (Sabiston et al., 2007) is not predictive of exercise participation.

The reasons that adolescents give for taking part in sport and exercise are commonly very positive. A synthesis of previous literature reports the most common themes to be (a) developing physical competence, (b) gaining social acceptance, (c) enhancing fitness and appearance, and (d) enjoyment (Weiss & Ferrer-Caja, 2002). In a more recent study the most frequent reasons for exercise reported by a cohort of 580 adolescents aged from 13 to 17 were; for fun, to keep fit, to hang out with friends, because they felt good at it, and because they "liked winning" (Utter et al., 2006). However, responses in this study were recorded on a forced choice questionnaire which included no options relating to self-presentation. When self-presentation goals are included in response options for adolescents, they rarely appear to be primary goals for taking part. For example, Furnham et al. (2002) recorded adolescents' responses on the Reasons for Exercise Inventory (REI), which provides a different range of response options including weight, fitness, mood, health, attractiveness, and enjoyment (Silberstein et al., 1988). Although girls were significantly more likely to report weight-related reasons for exercise (but not attractiveness) than boys, health and fitness were the most strongly endorsed reasons for exercise for both sexes, and enjoyment and weight control the least. These findings are supported by other research providing broad or free response formats; appearance-related reasons for exercising rank very low if they were mentioned at all (Kimm et al., 2006; Sirard et al., 2006)

Barriers to physical activity and reasons for dropping out of sport and exercise can also provide insight into the relationship of physical activity to other life goals during adolescence. Three key factors were reported by over 1400 adolescents as reasons why they dropped out of sport and exercise; lack of interest (including wanting to take part in other activities instead of sport), poor coaching style and/or quality, and time barriers (including clashes with preferred activities, Sirard et al., 2006). This provides some suggestion that exercise is devalued in favour of other pursuits. Indeed, in a study explicitly investigating the degree to which physical activity is considered important to adolescents, it is reported that value decreased in line with age in students of both sexes (Jacobs et al., 2002). Other barriers to physical activity have also been found to differ between age groups. Gyurcsik et al. (2006) report that while perceived lack of skill was a deterrent to physical activity at all ages, the social barriers of "friends not being physically active" and "lack of family support" were all reported to peak in mid-adolescence declining thereafter. The barrier of "negative self-presentation" was higher in early- and late-

adolescence than in mid-adolescence (i.e., 13-15), whereas “perceived intimidation from the social environment” and “negative experiences” while exercising with peers were lowest in early- and mid-adolescence, increasing in late adolescence. While the numbers involved in the study were low (one class group in each category) so may not generalise beyond this sample, they do provide support for the suggestion that barriers deterring adolescents from exercising are responsive to changing perceptions of the social environment. As such the findings are in line with the idea that the occurrence of health behaviours changes in line with the degree to which these activities are perceived to meet adolescents’ goals.

In considering the changes brought about on cognitions, goals and behaviours during mid-adolescence, this section has discussed evidence in support of a role for normative developmental processes interacting with the social environment in contributing to the decline in adolescent physical activity. It has been argued that while physical activity appears to be undertaken for positive reasons such as for fun and spending time with friends in adolescents of both sexes, these reasons may become insufficiently powerful to sustain the behaviour given the more pressing goals of forming a stable self-identity and sense of self-worth. This will especially be the case for individuals for whom physical activity, or factors of the environment in which physical activity takes place (e.g., PE, or wearing PE kit considered to be revealing) compromise their ability to control their self-presentation to others, or are in contradiction to social norms. However, whatever the justification for the observed decline in physical activity in adolescents, its study is undertaken with a view to finding ways in which it is possible to intervene to change behaviour. The next section provides an overview of previous intervention approaches to increase physical activity and exercise in adolescence.



## **Section 3: Reviewing Physical Activity Interventions in Adolescence**

Previously published reviews of interventions targeting adolescent physical activity<sup>1</sup> report mostly modest but positive conclusions, however many are guarded as to the quality of existing research in terms of research quality (Stone et al., 1998), lack of randomised controlled trials (RCTs; Marcus et al., 1998) or lack of theoretical application (Baranowski et al., 1998; Lewis et al., 2002; Michie & Abraham, 2004). This final criticism is perhaps particularly important. It is argued that the failure of many studies to take account of theory in their design not only fails to build on progress made by previous work such that each is effectively starting from scratch, but makes it difficult to establish what specific elements of the intervention are contributing to its outcome (Baranowski et al., 2004). Baranowski and colleagues advocate instead driving design through psychological theory by proposing and testing an explicit pathway of theoretically derived mediators that would be predicted to bring about a desired effect. This approach would incorporate specifying which environmental manipulations are attempted, their effect on the proposed psychosocial mediators of change (e.g., self-esteem, self-efficacy), and on the eventual outcomes.

Despite these criticisms, many studies do already incorporate theory into their design. A recent review of behaviour change interventions based in UK and US schools between 1999 and 2004 set out to specifically highlight the theoretical basis of each project extracted (Sharma, 2006). Eleven interventions were identified, of which three were carried out with adolescents (Gortmaker et al., 1999; Frenn et al., 2003; Neumark-Sztainer et al., 2003b). Eight studies employed a theoretical approach, however, these drew from only a very limited range of possible theoretical constructs, with all employing constructs from Social Cognitive Theory (SCT; Bandura, 1977), and one additionally incorporating the Transtheoretical Model (TTM; Prochaska et al., 1992). Baranowski et al. (2003) provide a useful overview of the ways in which these theories have been applied to exercise behaviour, and their outcomes. Of course the use of theory in design does not imply studies are of a high quality, and still relies on the ability of interventions to influence the proposed mediators in order to advance our knowledge of factors underlying behaviour change. Sharma (2006) stated that disappointingly few interventions reported the outcome on theoretical constructs or measures of the fidelity to protocol, this final factor considered crucial to the interpretation of results given that the majority were delivered by existing teachers following limited additional training.

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<sup>1</sup> Although the review is primarily concerned with exercise, the term physical activity is retained in the introduction to encompass all relevant studies and reviews for a preliminary discussion.

The reviews which include physical activity as an outcome variable vary widely in their outcome of interest, ranging from changes in physical activity itself, levels of fitness, or markers of obesity which make it difficult to cross-reference findings without referring to the original research papers. The only Cochrane review including physical activity interventions in children or adolescents focuses on the prevention of obesity (Summerbell et al., 2005). However, despite their lack of direct comparability and specificity to the present research question, useful insights into the difficulties and opportunities of physical activity interventions can be gained from an overview of their findings. For example, reviews of interventions aiming to reduce adolescent obesity report a greater chance of success for interventions which bring about a reduction in physical inactivity as opposed to those which reduce caloric intake or increased vigorous exercise (Baranowski et al., 2002; Biddle et al., 2004b; Sharma, 2006), and for interventions delivering exercise sessions through external trainers rather than usual classroom teachers (Sharma, 2006). In addition, Biddle et al (2004b) concluded that in order to get young people significantly more active, a multi-faceted approach involving schools, family and the community is needed, providing more accessible facilities and structured exercise opportunities in and out of school (Biddle et al., 2004b). The authors suggested that to have any effect this should be on a large scale involving extensive staff training and retraining, private sector investment, and Government intervention in developing initiatives such as safe walking and cycling to school projects (Biddle et al., 2004b).

There is no recent, comprehensive review specifically evaluating physical activity interventions in adolescence. As such, to provide a better appreciation of the nature, outcomes and omissions of previous research prior to embarking on the series of studies within the present thesis, a review of physical activity interventions for adolescents was undertaken. With reference to the discussions in this section, it was intended that the review would examine exactly what theoretical constructs have been incorporated in previous research, the outcomes of intended manipulations on theoretical constructs, and to assess not only whether interventions bring about statistically significant effects on physical activity, but whether those effects are meaningful. While it is recognised that at a population level even very small effects could have far reaching cost or public health implications, at an individual level statistically significant differences may not translate to perceptible change for an individual or their health. To allow an easier assessment of the strength of the evidence extracted and the degree to which it is meaningful, the results were translated into effects sizes and estimates of actual effect (e.g., minutes of exercise per day, or proportion of participants moving from a classification of inactive to active).

At the start of this chapter, it was stated that physical activity, exercise and sedentary behaviour represent very different behaviours that may require very different approaches to their study. While the solution to population-wide physical inactivity may lie in targeting all three of these, the present thesis aims to focus primarily on *exercise*. Exercise was selected as it is the domain of physical activity that represents volitional and purposeful (i.e., goal directed) activity, and thus which presents the most relevant behaviour to study in relation to changing adolescent goals and priorities. Therefore, the primary focus of the following review of interventions will be on their impact on purposeful exercise in adolescence.

### **2.3.1 Methodology of Literature Search**

In order to obtain a coherent picture of previous interventions targeting physical activity in adolescence, a systematic search of electronic databases (Pubmed, Web of Science, Psychinfo, & BIDS), and reference sections of retrieved articles was conducted. The search terms [physical activity /exercise AND child/adolesc\*] were entered into each database, with date restrictions of 1991 to April 2006<sup>2</sup>. Articles were initially screened through their titles and abstracts to identify those reporting on original research projects or reviews targeting physical activity or sedentary behaviour. The British Medical Association (BMA) definition of adolescence was adopted, setting the boundaries of adolescence at 11 and 19 years. The review was not restricted to randomised controlled trials (RCTs), but included all interventions retrieved through the search terms for which baseline and post-intervention physical activity data were reported. Details of the sample group, form of the intervention, its duration and effects were extracted, and where the information was available effect sizes were calculated. Additionally, in order to undertake a systematic comparison of the characteristics common to successful interventions, a qualitative comparative analysis was conducted (QCA, Ragin, 1987; 2006). This process involves extracting attributes of an intervention which are considered to be of potential importance in the final outcome (for example whether an intervention is delivered in a school or a health care setting), and allocating a binary yes/no outcome to each attribute for each study. The patterns of attributes across studies are then considered against the ultimate finding of success or failure. QCA does not attempt statistical comparisons, but can be a useful qualitative method for systematically comparing the performance of constituents of interventions across studies and their interactions, which may have important implications for the outcome. Software by which to run such comparisons is freely available (cf., QCA Ragin et al., 2006).

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<sup>2</sup> Date restrictions reflect that the review was finalised ahead of the final study, in May 2006.

## **2.3.2 Studies Retrieved from a Systematic Database Search**

Twenty studies aiming to increase physical activity in adolescents were retrieved (Table 2.1). Thirteen of these were school based interventions, four community based, and three based within health care. Ten incorporated an examination of the psychosocial mediators of behaviour change through the application of psychological theory. The nature of interventions within each setting will first be briefly discussed to illustrate the type of approaches attempted, after which the outcomes of the nine studies grounded in theory will be examined with respect to the outcome of the intervention on the proposed psychosocial mediators of change.

### **2.3.2.1 School based interventions**

Four studies focussed purely on improving the quality and/or quantity of exercise provided within schools [see Table 2.1, studies 1 to 4]. One intervention [1] reported large positive effects of providing structured fitness sessions using additional apparatus in the school grounds during lunch and break times (i.e., an increase from 2 to 10 minutes of vigorous activity in boys, and from 1 to 5 minutes in girls; Scruggs et al., 2003). However, the study activity only ran for three days, so did not explore whether involvement in the fitness breaks was sustainable, a particular concern for the majority of girls involved who did not enjoy the activity. Three projects grounded in SCT aimed to increase time spent in moderate to vigorous activity of adolescent girls through changing the way PE was taught [2 to 4]. The “LEAP” project [2] was a large scale (N=1049) complex intervention run over two years, reporting an increase of 2.8% in the proportion of girls engaging in vigorous physical activity in the intervention group compared with a decrease of 6.5% in the control schools (accompanied by a 2.4% increase, and 2.1% decrease respectively in moderate activity; Pate et al., 2005). These results related to a large effect size, and were associated with gains in self-efficacy in line with SCT (Dishman et al., 2004). However, the two similar programmes (“New Moves” [3] and “Project FAB” [4]) brought about no convincing increases in physical activity (i.e., small effect sizes, or varying results), although they also failed to bring about an increase in self-efficacy (Neumark-Sztainer et al., 2003b; Jamner et al., 2004).

Four studies combined changes to the PE curriculum with lesson based education aiming to enhance skills in self-management and goal setting, and providing health education (Burke et al., 1998; Dale et al., 1998; Gortmaker et al., 1999; Simon et al., 2006). For example, “Project Teens” [5] was a US based intervention run over a semester with 375 13-14 year olds, which involved a school curriculum change to provide pupils with gym sessions three days a week, supported by biweekly classroom based lessons (Dale et al., 1998).

**Table 2.1** Details and outcomes of physical activity interventions conducted with adolescents (age 11-19) retrieved through systematic database search.

Research Team	Sample characteristics	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size* (i) within group (ii) between group
1 <b>Scruggs, Beveridge, &amp; Watson, 2003</b>	Age=11 N=10 male, N=17 female No control group	Opportunistic sample.  School based.  Structured fitness breaks during school day.	No	3 days	Heart rate monitors, pedometers	Time spent w MVHR= an increase of 7 mins a day	(i) MVHR: $g=2.53$ ; VHR: $g=1.4$ , steps/min $g=1.5$ (for girls, boys even higher)  (ii) NA
2 <b>LEAP</b>  <b>Pate et al, 2005</b>  <b>Dishman et al., 2004</b>	Age=13.6; female only; IV Group N=1049; control N=1038	RCT  School based  Randomised by school, prospective design.  Aim to change method of instruction and school environment	SCT  Self-efficacy  <i>Manipulation check:</i> Supported by confirmation of fit of latent factor model	2 years	Self-report  3 day physical activity recall (3DPAR)	% girls vigorously active; IV increased 2.8% (68.6 to 72%) Control decreased 6.5% (72.9 to 70.8%)  % moderately active; IV increased 2.4% (40.2 to 43%) Control decreased 2.1% (45.6 to 39.1%)	(i) moderate to vigorous; $d=1.42$ vigorous; $d=.78$  (ii) moderate to vigorous; $d=2.56$ vigorous; $d=2.73$

Research Team	Sample characteristics	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size* (i) within group (ii) between group
<b>3</b> <i>New Moves</i>  <b>Neumark-Sztainer, Story, Hannan, &amp; Rex, 2003</b>	Age=15.4; female only; IV Group N= 89, Control N=112  Participants either overweight or at risk of becoming overweight due to inactivity.	RCT  School based  Randomised by School  Change in way PE is taught, single sex lessons, aim to enhance self-efficacy	SCT  self-efficacy  <i>Manipulation check:</i> Not supported by quantitative data	16 weeks  8 week social support f-u	self reported  modified LTEQ	Time spent active: IV: 6.21 hours/wk vs Control: 5.87 hours/wk  Time spent sedentary; 16.76 hours/wk vs 15.92 control  Differences smaller at 8 month follow up.	(i) insufficient data  (ii) Nil
<b>4</b> <i>Project FAB</i>  <b>Jamner, Spruijt-Metz, Bassin, &amp; Cooper, 2004</b>	Age=10.96; female only; IV Group N=25. Control N=22 All sedentary and inactive	RCT  Randomised by school  Increased variety and choice of activity, twinned with self management/ goal setting teaching	Mediators:  Self-efficacy, barriers, social support  <i>Manipulation check:</i> Not successful	4 months	Self-report  2-day physical activity recall (2DPAR)  Stanford Usual Physical Activity Scale	Intervention group: 49% increased to 84% engaged in MVPA;  Control: 35% increased to 40% (OR=6.97)	(i) Light exercise; $d=-.43$ moderate exercise; $d=.41$ (ii) Light exercise; $d=.58$ (control group greater) Moderate exercise; $d=.55$ (IV group greater)
<b>5</b> <i>Project Teens</i>  <b>Dale, Corbin, &amp; Cuddihy, 1998</b>	Grade 9; (age 13-14) Male N=183, Female N=192 No control group	Opportunistic cohort Study  Change to PE curriculum, integrated with other school lessons.	Conceptual physical education approach	1 semester	Self report – taken from Youth Risk Behaviour Survey	Boys: MPA – 33% boys reached targets vs 27% (NS); VPA – 86% vs 76% (NS)  Girls MVPA – 31% vs 21% reached targets (NS) VPA – 70% vs 62% (NS)	(i) and (ii) insufficient data

Research Team	Sample characteristics	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size* (i) within group (ii) between group
<b>6</b> <b>Burke et al., 1998</b>	Age=11; N=800, of which; N= 230 high health risk factors for CVD N= 570 low health risk factors for CVD	RCT  Fitness sessions provided during school time.	None	20 weeks	7 day diary	No significant change in PA according to diaries. No figures given.	(i) Nil (ii) insufficient data
<b>7</b> <b>Planet Health Gortmaker et al, 1999</b>	Age: 11.7 48% female IV Group N=641 Control N=654	RCT  Randomised by school  Integrated school programme, focus on providing choice in activity, but enforced reduction in TV time	SCT  Psychosocial mediators not included in the results  <i>Manipulation check:</i> not available	2 years	Self-report Youth activity questionnaire	Moderate/vigorous activity: Female – incr. 6 min/day (control – incr. 4 mins) Male – decr. 6 mins (control – decr. 3 mins)  Sedentary behaviour: Female – decr. 45 mins (control – incr. 7 mins) Male – decr. 42 mins (control – decr. 7 mins)	(i) insufficient data  (ii) Moderate/vigorous activity; Girls $g = .04$ Boys $g = -.12$  Sedentary behaviour Girls $g = -2.19$ Boys $g = -2.06$
<b>8</b> <b>ICAPS Simon et al, 2005</b>	Age=11.5 49% male IV Group N=475 Control N=479  Overweight adolescents, attempted to engage discussion and provided facilities in and out of school	RCT  School setting.  Multi-faceted programme incorporating lesson based education, improved opportunities for exercise, and links to the wider community.	Psychosocial variables included self-efficacy, social influence  <i>Manipulation check:</i> not available	4 years ultimately, 6 month results presented	Self-report  Modifiable Activity Questionnaire for adolescents (MAQ)	Participation in leisure time supervised PA: Increase of 19% vs no increase in controls. OR 2.74  Sedentary behaviour: decreased from 34% to 28%, compared with an increase (NB 27% to 36%) in controls. OR .49	Not calculable from OR data

Research Team	Sample characteristics	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size* (i) within group (ii) between group
9 Schofield, Mummery, & Schofield, 2005	Age=15.9 ; Female only; IV Group (a) N=27 IV Group (b) N=28 Control N=30  least active selected	Quasi experimental control design.  School based  Randomised by school, to: IVa – target number of steps per day IVb – target minutes of activity per day Control	none	12 weeks -6 weeks with meetings -6 weeks maintenance	Sealed pedometers over a 4 day period	At 6 weeks: Blocks of MVPA/day: b) increase 1.1 c) increase 2.8 d) decrease .4  Blocks of VPA/day a) increase 1.3 b) increase 1.2 c) increase .2  (a) and (b) equivalent, significantly different from (c). No differences at 12 weeks.	(i) By week 6;  MVPA; $d=.27$ VPA; $d=.32$  (ii) insufficient data
10 Goran & Reynolds, 2005	Age range:8-11, IV Group N=62 Control N=60	RCT  Educational programme delivered through CD	SCT  <i>Manipulation check:</i> All had marginal significance ( $p=.05$ to $.07$ )	8 weeks	Accelerometer over 5 consecutive days.  Data grouped into % time spent in light, moderate, vigorous or very vigorous activity.	<i>Between groups:</i> Light activity: IV group=.78% time vs control=.78% time Moderate activity: IV group = .15% vs Control .17% time Vigorous activity: IV group .026% vs Control .019 MVPA: IV group .18% time vs control .19%	(i) Light; $d=.07$ moderate; $d=-.35$ vigorous; $d=.07$ MVPA; $d=-.13$  (ii) Light; $d=.27$ moderate; $d=-.8$ vigorous; $d=-.1$ MVPA; $d=-.57$



Research Team	Sample characteristics	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size* (i) within group (ii) between group
11 Wilson et al 2005	Age= 11 61% female IV Group N=28 Control N=20  Underserved adolescent after school programme	Quasi experimental  School based  After school programme incorporating physical activity, and self-management	SDT and SCT  motivation, self-concept, self-efficacy and enjoyment  <i>Manipulation check:</i> – changes corresponded to increases in motivation, self-concept.	4 weeks	accelerometer	Moderate activity- IV increased 17.17 min/day vs control decrease of 16.18 min/day  MVPA – IV increased 22.4 min/day vs control decrease 23.02 min/day  Vigorous activity – IV increased 3.8 min/day vs control decrease 5.2 min/day	(i) moderate min/day; $d=.55$ MVAP min/day; $d=.66$ Vigorous; $d=.11$  (ii) moderate min/day; $d=5.02$ MVAP min/day; $d=3.67$ Vigorous; $d=.43$
12 Prochaska & Sallis, 2004	Age=12.1; 65% female IV Group (a) N=46, IV Group (b) N=46 Control N=46	RCT  School based  Randomised by class to; (a) physical activity and nutrition intervention, (b) physical activity only intervention, or (c) no intervention control.	No	1 off 30 minute session.  F-u at 3 months	accelerometer for 1 week	No difference between groups a&b.  Boys in IV increased PA by 2 min/day. Girls decreased 11.5 min/day.  Control boys decreased by 33.min/day, and girls 15 min/day.	(i) insufficient data  (ii) $d=1.05$ for boys, (i) $d=.22$ for girls  NB control deteriorated a lot for boys, suggesting maybe reactivity to wearing accelerometer.

Research Team	Sample characteristics	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size* (i) within group (ii) between group
13 Frenn, Malin, & Bansal, 2003	Age= 12-17 (mean=13.82) 52% female N=182 (split not stated between intervention and control)	Quasi experimental  Classroom based education sessions, linked to PE	TTM  <i>Manipulation check:</i> moved through stage of change	4 weeks (4 sessions)	Child and Adolescent Activity log (CAAL)	Not presented – but greater duration for the intervention group was stated along with t statistic ( $t(81)=2.29, p<.01$ )	(i) insufficient data  (ii) $*g=.64$  (estimate only due to insufficient data)

## B) Community Setting

Research Team	Sample	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size (i) within group (ii) between group
14 Huhman et al., 2005	Age= 9-13  N=2732 parent/child dyads No control group	Prospective study.  Community based.  Initial sample selected randomly, final sample consisted on those who responded to cold calling.  Intervention consisted of television adverts backed up by school curriculum, estimated exposure 8xmonth.	None	1 yr	self-reported physical activity	Nil – change : -  Those who had viewed adverts reported change from .16 to 1.24 (bouts PA/week)  Female:- increase .7 (.06 to 1.33) Low parent education:- 2.20 (.52 to 3.87) Urban living :- 1.16 (.35 to 1.97) Least active (<3 sessions p/w):- .84 (.27-1.42)	(i) insufficient data  (ii) Those active (inactive) before intervention: unaided recall vs no recall group: $g=1.52$ ( $g=1.02$ )  Aided recall vs no recall group, $g=.7$ ( $g=2.45$ )

Research Team	Sample	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size (i) within group (ii) between group
15 <b>DAMET</b>  <b>Ransdell, Dratt, Kennedy, O'Neill, &amp; DeVoe, 2001</b>	Age= 11-17 Female only N=26, mother daughter diads/triads No control group	Community setting  Participants attended education/PA sessions at University	SCT  Physical self perceptions  <i>Manipulation check:</i> Successful	12 weeks	Self reported  Behavioural risk factors surveillance survey	Bouts of exercise per week: Pre-intervention=2.6 Post-intervention= 3.6 6 month FU= 3.3  No difference statistically significant	(i) pre-post intervention $d=-1.6$  Pre-FU $d=-1.1$  (ii) NA
16 <b>Jago et al, 2006</b>	Age=13; male only; IV Group N=238 Control N=230	RCT  Community based.  Randomised by Scout Troop, activity sessions during scout meetings, combined with internet programme	skills building and role modelling  self-efficacy, preferences  <i>Manipulation check:</i> Not successful on self-efficacy	9 weeks	MTI accelerometer worn for 3 days	Time spent in sedentary activity; IV increased 5.9 mins/day vs control 7.7 (marginally significant).  Light activity IV increased 12 mins vs Control decrease 8.2 mins/day ( $p<.05$ )  MVPA IV increased 2.9 mins/day vs Control group 1.8 (NS).	(i) Time 1: Sedentary; $g=.5$ , light exercise, $g=-.61$ , MVPA $g=-.4$  Time 2: Sedentary; $g=-.08$ , light exercise, $g=.85$ , MVPA $g=-1.3$  (ii) Time 1: Sedentary; $g=.08$ , light exercise, $g=.03$ , MVPA $g=-.74$  Time 2: Sedentary; $g=-1.23$ , light exercise, $g=.77$ , MVPA $g=.41$

	Research Team	Sample	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size (i) within group (ii) between group
17	Roemmich, Gurgol, & Epstein, 2004	Age =11; IV Group N=11, Control N=7	RCT  Community setting.  Home based trial of open loop accelerometer feedback, using sedentary (TV viewing) rewards.	Behavioural engineering	6 weeks	Accelerometer	Physical Activity - increased 24% above baseline, for 32% more of the time  Sedentary behaviour 22% below baseline. No difference in overall time spent in sedentary activities when TV viewing limited.	(ii) and (ii) insufficient data

### C) Health care setting

	Research Team	Sample	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size (i) within group (ii) between group
18	Ortega-Sanchez <i>et al.</i> , 2004	Age: 12-21; IV N=222; Control N=226  Recruited through routine primary care visits.	RCT  Primary care based.  Initial one-off consultation arranged providing advice on achieving and maintaining exercise levels, followed up at 6 months.	None	1 yr (2 visits)	Self report, no established scale used	IV increased activity by 36.8 min/48.3 min/week (6/12 months)  Control decreased activity by 28.1 min/36.6 min/week (6/12 months)	(i) insufficient data  (ii) Minutes of exercise per week: $g=1.72$ at 6 months and 2.21 at 12 months.  No. days of exercise per week: $g=1.9$ at 6 months, 2.3 at 12 months.

Research Team	Sample	Intervention Type	Theory base (mediating variables)	Duration	Physical Activity Measure	Actual Effect	Effect Size (i) within group (ii) between group
<b>19</b> <i>PACE+</i> <b>Patrick et al, 2001</b>	Age= 14.4 60% male IV Group N=148 Control=not stated  Recruited from medical outpatient clinics.	RCT  Primary Care Setting  Computer based educational programme, plus; a) no contact (control) b) frequent mail c) infrequent mail and telephone d) frequent mail and telephone		4 months	Self report (specially developed measure, previously validated)	Moderate activity (N attempting change=59): IV group 3.1 to 4.53 times/week Control 4.4 to 4.22 (p<.001)  Vigorous activity (N attempting change=35) IV group 4.17 to 4.57 times/week Control 3.94 to 4.35 times/week	(i) Moderate activity: $d=.81$  Vigorous activity $d=-.01$  (ii) insufficient data
<b>20</b> <b>Deforche, De Bourdeaudhui j, Tanghe, Hills, &amp; De Bode, 2004</b>	Age: 10-17; N=24. No control group.  All participants obese	Single cohort study.  Residential treatment setting.  Intensive residential diet and exercise treatment	SCT, and TPB  Self-efficacy, perceived barriers  <i>Manipulation check:</i> No change in mediators	10 months  (further follow up at 70 weeks)	Self-report. Minnesota Leisure Time Physical Activity Questionnaire, delivered by interview.	Total PA increased 15.8 mins/day (NS)  Moderate to high PA increased 33.6 mins/day (NS)  Low level PA decreased from 41.4 mins/day to 17.7 mins/day (NS)	(i) End of treatment: Total PA $g=.19$ , light PA $g=-.57$ , moderate to vigorous PA $g=.51$  70 week follow up: Total PA $g=-.02$ , light PA $g=.08$ , moderate to vigorous PA $g=-.06$  (ii) insufficient data

Notes: PA: physical activity; F-U: follow up; SCT: Social Cognitive Theory; RCT: randomised controlled trial; IV intervention group; MVPA: moderate to vigorous physical activity; ES=effect size; SDT: Self Determination Theory  
\* effect sizes calculated as Hedges  $g$ ;  $g > .03$  small effect size;  $g > .05$  moderate effect size;  $g > .08$  large effect size; only physical activity outcomes listed (not always primary outcome for the intervention); only N completing follow up listed

One year after the study, an increase of approximately 10% in the number of adolescents reaching Government recommended activity targets was reported, although the differences did not reach significance, and results across different exercise intensities were inconsistent. Burke et al ([6] 1998) reported no change in leisure time activity from self-report diaries following a 20 week integrated intervention with 800 young adolescents, however they did note increases in fitness, and reduction of body fat in both sexes. "Planet Health" [7] tested an intervention combining increased choice in physical activity with enforced reduction in television viewing time (Gortmaker et al., 1999). It was successful in reducing sedentary behaviour in both sexes, but had no effect on moderate to vigorous activity in girls. Of greater concern, moderate to vigorous activity decreased in boys following the intervention. The French ICAPS programme [8] showed more promising results, although only provisional six month data has so far been published. ICAPS was run in partnership with organisations outside the school over a four year period, it included parental involvement, and focused on promoting the positive aspects of lifestyle exercise, such as having fun, socialising and the pleasure of feeling fit (Simon et al., 2006). An increase in the proportion of adolescents involved in leisure time activity and a decrease in the proportion of those remaining sedentary was reported, although the effects of the intervention on the proposed mediating variable of self-efficacy are not yet available.

Five studies attempted to extend their reach beyond the school environment, using schools as a base to present practical tasks or education to students to encourage them to become more active during their free time out of school [9 to 13]. With an inactive group of 15 year old girls, Schofield et al., ([9] 2005) equipped students with open pedometers and compared the effects of framing challenges for increased activity in terms of (a) reaching a target number of steps per day, (b) a target number of minutes of exercise per day, or (c) a no target control group. A small positive effect was reported at six weeks for both intervention groups above the control group, increasing to a moderate effect after 12 weeks. Two studies delivered interventions during after-school programmes, aiming at increasing activity in the hours immediately after school. Goran and Reynolds (2005) delivered this through a computer based multimedia curriculum (IMPACT; Interactive Multimedia for Promoting Physical Activity in Children [10]), and reported an increase in light activity of 20 minutes a day in the intervention group as a result, albeit at the cost of a reduction in moderate activity levels of eight minutes a day. However, there was only a marginal effect on the hypothesised mediators, and the differences between the intervention and control group were either negative (of a medium effect size, for moderate to vigorous physical

activity) or negligible. Wilson et al. (2005) reported a large effect size for moderate to vigorous physical activity (MVPA) following a four week after-school intervention combining education with practical sessions [11]. However, this was largely due to significant declines in activity level in the control group (i.e., a decrease of 23 minutes per day of moderate activity) raising questions as to the reliability of measurements (Wilson et al., 2005). Two further studies based educational sessions within formal school lessons to target activity outside school, and showed some positive effects. Prochaska and Sallis ([12] 2004) reported large effect sizes for change in physical activity in boys, but only a small effect for girls following a one-off educational intervention lesson. Frenn et al. ([13] 2003) reported a positive effect on time spent exercising following a four week programme tailored to students' stage of change (in line with the TTM), in addition to a positive effect on participant stage of change. However insufficient data were presented to assess the size of this effect.

### **2.3.2.2 Community based interventions**

Interventions based outside school reflect the recognition that increasing physical activity in leisure time is crucial in obtaining sufficient activity for health. Few school based programmes have demonstrated a link between increasing activity levels in PE, and increased leisure time activity (Almond & Harris, 1998). Four community based studies were extracted by the present review, ranging from a media based campaign, to interventions focusing on formalising parental involvement, to approaches similar to those based in schools, but delivered in a community setting, and met with varying success. The "VERB" advertising campaign [14] combined television advertising with the distribution of materials to schools and community sites, and reported a large positive effect on the self-reported exercise of young people aware of the campaign compared with those who were not (Huhman et al., 2005). However, it did not control for factors which may have effected how receptive individuals were to the campaign message, or for the separable effects of the promotion of the campaign messages through the various community settings involved (e.g., whether it was taken up by an individual's school teacher).

Another community-based programme aimed to increase girls' physical activity through encouraging mothers and daughters to exercise together (Daughters and mothers exercising together, DAMET, [15]). The programme resulted in improved reports of the proposed psychosocial mediators of change (physical self perceptions), but no statistically significant differences in the number of bouts of exercise taken per week (Ransdell et al., 2001). A community project based within a scout troop [16] was the only study to work with an all male group. It incorporated role modelling and skills building combined with an internet programme accessed both at scout meetings and at home (Jago et al., 2006). The results for both physical activity and sedentary

behaviour measured through three days of accelerometer data, showed no improvement immediately after the intervention, but small improvements in physical activity, and a large effect on sedentary behaviour six months later. The final study based in a University lab setting [17] with a view to future community application involved providing participants with open accelerometers to allow them to monitor their activity levels, and rewarding time spent in physical activity with television viewing credits (Roemmich et al., 2004). Although the results for total physical activity were positive over 6 weeks (24% of participants increased their activity level above baseline), the effect of the reward cannot be differentiated from the effect of the feedback provided by the accelerometers.

### **2.3.2.3 Interventions based within health care**

Three research studies were conducted within health care settings. It is known that in other fields (i.e., smoking cessation) that simple physician advice delivered opportunistically on attending the doctor can be effective at triggering initial behaviour change (Senore et al., 1998). Based on this premise, Ortega-Sanchez et al., (2004) tested an intervention based on initial brief advice from a general practitioner (GP) supported by two one-to-one nurse led “well-child” sessions [18]. The findings obtained through self-report were positive, however there are methodological concerns as to their reliability; firstly, self-reports may be subject to greater over-reporting by the intervention group than in the no-contact controls through wishing to please the nurses who had tried to help them, and secondly the results were not reported on an intent to treat basis. A second intervention based within primary care, “PACE+” [19], involved a computer based educational programme accessed in doctors’ surgeries, with randomisation of participants to varying degrees of follow up support. Self-reported outcomes for moderate intensity exercise were of a moderate effect size, but there was no effect on vigorous activity (Patrick et al., 2001).

The most intensive of the interventions reported was delivered to obese adolescents in a residential setting ([20], Deforche et al., 2004). The approach combined elements of the TTM (i.e., tailoring to participants’ stage of change) and SCT (i.e., attempting to increase self-efficacy), but the results are difficult to generalise as the sample size was small (N=24), the age range spanned puberty (range 10-17), and the treatment was intensive (i.e., 2 hours supervised activity per day in a residential setting). Even with this intensive approach the size of the effect was at best moderate in the short term, and did not persist up to the 6 month follow up. Additionally, while the intervention was successful in reducing perceived barriers to exercise, the treatment programme did not result in any improvement in self efficacy.



#### **2.3.2.4 Performance of psychosocial mediators of change**

Ten studies incorporated mediators identified by SCT (Bandura, 1977) in the process of bringing about behaviour change. All ten reported the outcome of the intervention on self-efficacy, and eight incorporated self-management or goal setting training intended to bring about a change in the SCT construct of self-control. It was predicted that changes in physical activity levels would be mediated through a change in self-efficacy and self-control (although this second factor was not explicitly measured), and that changes in self-efficacy would necessarily bring about changes in physical activity. Three studies reported a positive effect on self-efficacy, of which two reported corresponding positive results in terms of physical activity consistent with theoretical assumptions of mediation [2 and 11], and one study showed no corresponding behavioural effect [15]. Five studies reported no effect of the intervention on self-efficacy, of which two also showed no effect on behaviour consistent with the mediation hypothesis [10 and 20], and three reported increased activity despite the lack of change in the proposed mediator [3, 4 and 16]. Two studies did not report the effect of the intervention on mediators [7, 8]. Thus overall, four findings were consistent with theory (i.e., behavioural outcome matched the self-efficacy outcome), and three were inconsistent (i.e., behavioural outcome was in the opposite direction to that predicted by the effect on self-efficacy).

One study applied the TTM [13], and while the authors reported positive effects on both decisional stage of change and duration of exercise, they did not explicitly relate the two. As such it is not possible to discern whether the positive behavioural effects were as a result of participants moving from the stage of the contemplation to action, or fewer participants moving from maintenance to relapse, both of which would provide support for the theoretical associations. The alternative would be that the outcome was independent of stage of change, for example if exercise duration increased only through greater participation by those already active.

One study applied the Theory of Planned Behaviour (TPB) in combination with SCT [20]. Changes in attitudes towards physical activity were monitored in addition to behavioural outcomes, but they showed no positive treatment effect, although there was a potential ceiling effect as attitudes were very positive even at baseline. Participants reported no change in perceived barriers during treatment, although these declined afterwards, whereas social support from family improved during treatment, but declined after the programme. Thus, in addition to a lack of effect on self-efficacy, the intervention did not report a consistent effect on the mediators of the TPB. As there was no lasting treatment effect however, these findings do not contradict the predicted pathways of effect, but suggest that other means to influence them are needed.

Thus, interventions were mixed in their efficacy of bringing about an effect in the proposed mediators of change. The relationship of successful manipulations to behavioural outcomes is explored further in the following section.

### **2.3.2.5 Common themes to successful interventions**

The characteristics of the studies retrieved were tabulated against their success or failure to bring about a positive effect on moderate to vigorous physical activity (MVPA)<sup>3</sup>. MVPA was chosen rather than sedentary behaviour or light exercise, as it was considered to represent volitional activity taken for the purpose of exercise, the focus of the present thesis. The results are presented in Table 2.2. The characteristics extracted were selected as those highlighted to be of potential importance to outcomes by previous reviews (Baranowski et al., 1998; Marcus et al., 1998; Stone et al., 1998; Lewis et al., 2002). These were;

- the (successful) manipulation of psychosocial mediators,
- setting (i.e., delivered in or out of school),
- presence of a practical physical activity component,
- presence of an education component,
- delivery on an individual or group basis,
- integration with parents/community,
- duration (> or < two months),
- mixed or single sex,
- younger ( $\leq 12$ ) or older adolescents,
- a general or at-risk population (i.e., sedentary and/or obese)

Finally, to check the impact of the method of measurement on results, the outcomes of self-report versus objective measure of exercise were compared. Odds ratios were calculated for the likelihood of a positive outcome. The nature of the instructor delivering practical interventions was not included (i.e., existing teachers or external instructors), as only two studies reported employing non-teaching staff [3 and 9], one of which employed a combination of existing teaching and external staff [3].

The odds ratios for success in single sex interventions above mixed groups, for younger over older adolescents, for studies delivered in schools versus the community or health settings, or for at-risk populations above the general population were found to be close to unity, indicating that there is little difference expected in outcome according to these study characteristics. A poorer chance of success was reported for interventions of a duration of under two months (OR=.75; although may of these may

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<sup>3</sup> Moderate intensity exercise was reported if MVPA was not listed

**Table 2.2 Study characteristics and associated outcomes for moderate to vigorous activity for detection of commonality among successful interventions**

Study	Theory Based	School Based	Not Group	Practical session	Education component	Community integration	Duration >2 months	Female Only	Age 12 or over	At risk	Self-Report measure	Outcome
1	0	1	0	1	0	0	0	0	0	0	0	1
2	1+	1	0	1	1	1	1	1	1	0	1	1
3	1-	1	0	1	0	0	1	1	1	1	1	0
4	1-	1	0	1	1	0	1	1	0	1	1	1
5	0	1	0	1	1	1	1	0	1	0	1	0
6	0	1	0	1	0	1	1	0	0	1	1	0
7	1 (nr)	1	0	1	1	1	1	0	0	0	1	0
8	1 (nr)	1	0	1	1	1	1	0	0	1	1	1
9	0	1	0	1	0	1	1	1	1	1	0	1
10	1-	1	0	0	1	0	0	0	0	0	0	0
11	1+	1	0	1	1	1	0	0	0	1	0	1
12	0	1	0	1	1	1	0	0	0	0	1	1
13	1+	1	0	0	1	0	0	0	1	0	1	1
14	0	0	1	0	1	1	1	0	0	0	1	1
15	1-	0	1	1	1	1	1	1	1	0	1	0
16	1-	0	0	1	1	1	0	0	1	0	0	1
17	0	0	1	1	0	1	0	0	0	0	0	0
18	0	0	1	0	1	0	1	0	1	0	1	1
19	0	0	1	0	1	0	1	0	1	0	1	1
20	1-	0	1	1	1	1	1	0	1	1	1	0
<b>Odds Ratio for success</b>	2.5*	1.08	0.78	0.67	1.67	1.22	0.75	1.00	1.00	0.93	0.86	

Note: 1=characteristic present, 0=characteristic absent; += mediators successfully manipulated, -= mediators not successfully manipulated, (nr)= not reported; \*=odds ratio of success if mediators successfully mediated, vs unsuccessful mediation; MVPA=moderate to vigorous physical activity. For key to study numbers see Table 2.1

purely reflect shorter follow up periods), for interventions without a practical component (OR=.67), and for interventions delivered to adolescents in groups (i.e., when together with their peers) rather than on an individual basis (OR=.78). Greater chance of success was reported for interventions including an educational component (OR=1.67). Interventions that attempted to link into the child's community through liaising with parents or community facilities outside school appeared to have a better chance at success (OR=1.22) than those delivered solely within school, or to the individual alone. This is consistent with recommendations stemming from a previous review (Biddle et al., 2004b). Studies using objective reports of physical activity reported better outcomes than those using self-report measures (OR=.86), which is an interesting finding given that objective measures are conventionally considered to be of greater accuracy. However, for two of the seven studies using objective measures [11 and 12], the positive effect of the intervention resulted from large decreases in activity reported by the control group, of considerably greater degree than would be expected over a period of a few weeks (e.g., a decrease in 33 minutes activity per day in control arm versus an increase of 2 minutes in the intervention arm). As such these present a substantial methodological concern. Finally, the largest odds ratio for success was reported for studies incorporating theory that were successful in manipulating their proposed psychosocial mediator of change (OR=2.5). Thus, the analysis provides support for the application of theory to intervention research.

Qualitative comparative analysis (QCA) also involves analysis of the patterns of co-occurrence between characteristics on outcomes (i.e., interaction effects), to enable the identification of sufficient attributes (i.e., all interventions with this factor will be successful) and necessary attributes (i.e., no interventions without this attribute will be successful). Due to the relatively small number of studies included in the review displaying a large number of different possible permutations of attributes, few profiles had a sufficiently similar pattern of characteristics to provide insight in the overall findings. Only one pair of studies had all the same attributes [18 and 19], both reporting positive outcomes. These were the two primary care based studies, which had in common a general population sample, the provision of individually tailored advice over a period of more than two months, and working with adolescents over the age of twelve (Patrick et al., 2001; Ortega-Sanchez et al., 2004). Neither study incorporated the use of theory.

For studies based within schools, a physical activity component of the programme was common to all successful interventions. However, as only two of the 13 school based studies did not include a practical component this finding may not provide great insight. However, as the nature of the practical sessions were fairly homogenous across studies,

as most attempted to build self-efficacy and follow a child-centred approach, it does allow the conclusion that this approach is useful for promoting activity in adolescents. It also provides a qualification to the odds ratio that indicated a disadvantage for interventions incorporating a structured physical activity element, which suggests that this is perhaps more relevant to studies delivered outside school, where an educational component appears to be of greater use. Finally, considering only those interventions carried out with at-risk populations, a practical physical activity component delivered individually rather than in groups, was common to all successful interventions.

### **2.3.3 Discussion**

A systematic review of physical activity interventions for adolescents resulted in the retrieval of 20 studies. Common factors among interventions that increased MVPA were the inclusion of a structured physical activity component for interventions delivered within schools or to at-risk populations, and the inclusion of an educational component to those delivered outside schools. Greater chances of success were also indicated by integrating interventions with the adolescent's home or community environment, and by the successful manipulation of psychosocial mediators of change, in most cases self-efficacy. These results apply to MVPA only, as different factors may well be of importance to changing the occurrence of exercise of different intensities, or reducing sedentary behaviour. A greater number of studies is called for to assess the reliability of these findings by ascertaining whether the same patterns of attributes predict positive outcomes in all studies. When more examples are available, ever greater breakdown of the existing attributes may lead to increasing specificity of the essential components of successful interventions (for example deconstructing physical activity sessions to assess whether they increase fitness, promote self-efficacy, allow adolescents to choose what they wore, etc.)

The effect sizes of outcomes ranged widely from those reporting marginal gain, to very large effects. However, the reliability of reported positive effects is brought into question by the variability of methods of reporting outcomes between studies (e.g., percentage of students reaching target standards, versus number of minutes of exercise per day), and by unexpected deleterious results for participants in the control groups in a number of studies (perhaps due to methodological issues, such as reactivity or social desirability). Overall, as expected from the reports of previous reviews of interventions with children and adults, the findings of the present research projects were modest at best, and the lack of consistency in the reporting of results compromised the comparability of findings. At the start of this section it was discussed that theory-based approaches can provide greater facility for studies to build on previous work to improve interventions. Ten of the

studies incorporated in this review attempted the manipulation of theoretical constructs, however, only three [2, 11 and 13] brought about the intended result on the psychosocial mediators. The improvements brought about in self-efficacy related to a successful MVPA outcome in all three cases, indicating that the environmental manipulations could be usefully applied to future research. In addition to including a measure of the effect of the intervention on self-efficacy, one study also reported a mediating role for student motivation [11] from the perspective of self-determination theory (SDT; Deci & Ryan, 1985a; Ryan & Deci, 2002). A greater evaluation of the opportunities that SDT presents for promoting exercise increase beyond that of self-efficacy will be addressed in the next section.

## Section 4: Self-Determination Theory

Self-Determination Theory (SDT) is a framework of human motivation that stems from the premise that “people possess an innate constructive tendency towards psychological growth and integration, striving to make sense of the world, express their talents, maintain positive well-being and develop a unified sense of self” (Deci & Ryan, 1985a; Ryan & Deci, 2002, p5). SDT views people as active participants in the construction of positive experiences, integrating themselves with the environment, rather than as passively responding to, or being conditioned by events. As such, the interaction between the individual and the environment are crucial for growth and development.

In determining what constitutes motivation of high or poor quality, SDT proposes that motivation falls along a continuum from the least to the most self-determined. The more self-determined the motivation, the better its quality in terms of the outcomes it predicts. In the short term, self-determined motivation predicts positive behavioural outcomes such as effort and persistence (Deci et al., 1999; Gagne et al., 2003), positive cognitive outcomes such as interest and enjoyment (Reis et al., 2000), and positive psychological outcomes such as well-being and affect (Deci et al., 2001; Ryan & Deci, 2002). Over the longer term these contribute to the development of personality, behavioural quality, and personal experience. The assertion that people possess an innate tendency to actively integrate themselves with their environment, and thus experience these positive outcomes is crucial to the dynamic nature of motivation suggested by SDT. The process through which the social environment is integrated within individuals is termed *internalization* (Ryan & Deci, 2000b). This process facilitates the gradual adoption of social norms and values, and behaviours that were initially externally motivated (e.g., from parental instructions), that is essential for a person’s assimilation into their community (Deci et al., 1994). However, whether or not this process takes place and people are able to exploit their tendency to internalise external prompts to behaviour depends on factors within the social and contextual environment (Ryan & Deci, 2002). Importantly, it is a person’s perceptions of the environment, rather than factors which can be objectively observed, that are important in determining its effect, and the same environment may be perceived very differently by different people (Deci & Ryan, 2002).

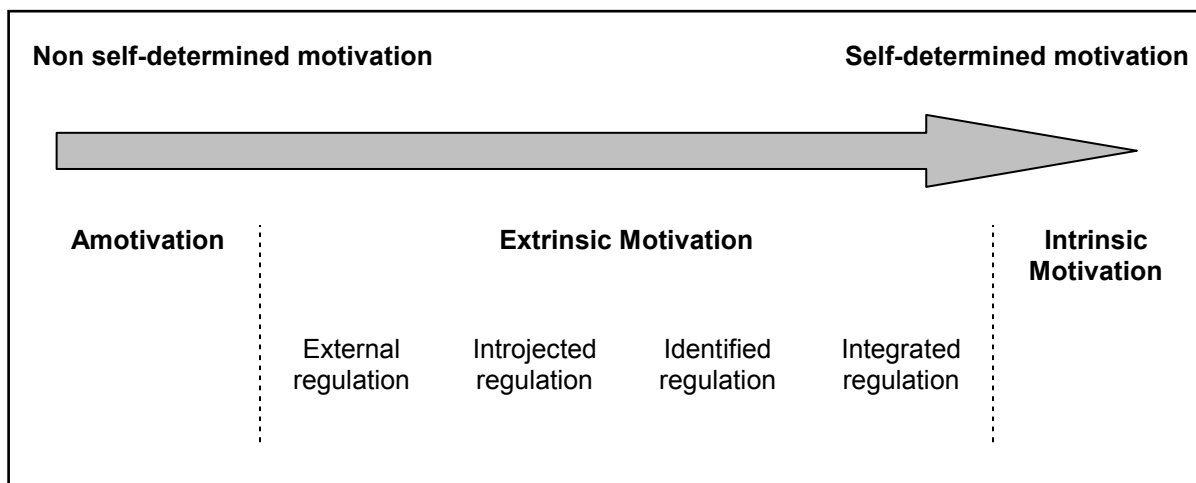
There are four sub-theories within SDT that describe the environmental characteristics hypothesised to affect whether or not people can feel self-determined in their actions, and predict whether an environment will support, or impede internalization. The four sub-theories of SDT are *organismic integration theory* (Deci & Ryan, 1985); the theory of *basic psychological needs* (Deci & Vansteenkiste, 2004); *cognitive evaluative theory* (CET; Deci

& Ryan, 1975); and *causality orientations* (Deci & Ryan, 1985b). The first two will be presented here as they are central to the present thesis, but for an overview of *CET* and *causality orientations* see Ryan and Deci (2002).

### 2.4.1 Organismic Integration Theory

*Organismic Integration Theory* provides greater detail and insight into the nature of the different qualities of motivation that lie along the continuum proposed by SDT. Motivation is classified into three major types; *intrinsic*, *extrinsic*, and *amotivation*. At its most self-determined, motivation is referred to as *intrinsic*, relating to the form of regulation that moves a person to act entirely out of their own volition, without need for encouragement, through the inherent pleasure of taking part in that activity (Deci & Ryan, 1985). At the other end of the continuum is *amotivation*, relating to the absence of motivation to act, which has been likened to learned helplessness. Between these two extremes lies *extrinsic* motivation, which relates to all behaviour that is initiated from external sources encompassing the majority of adult behaviours. *Extrinsic* motivation is further differentiated into four types, according to the degree to which the external contingencies guiding behaviour have been internalised. The distribution of motivational regulations is depicted in Figure 2.1.

**Figure 2.1 Continuum of Self-Determined Motivation**



The least self-determined of the extrinsic motivation types is *external regulation*, which relates to activities undertaken either for tangible reward (e.g., payment), through coercion (e.g. parental control) or when acting to avoid penalties (e.g., abiding by the law). Next along the continuum is *introjected regulation*, which describes motivation for which there is some degree of personal regulation following partial internalization of external contingencies. However, behaviour is still considered to be largely externally controlled. People acting from introjected regulation do so to avoid feeling guilty, or because they feel



they 'should'. It reflects a personal commitment to abide by the rules of others, for example a child may try hard in school PE not because they enjoy or value the lesson, but because they do not want their teacher to think badly of them. If social norms and values can be further internalised to take on personal meaning and importance, behaviour becomes motivated through *identified regulation*. This form of motivation remains external, as behaviour is still considered to be separate from a person's other beliefs and values. However it is more self determined than introjected regulation as it relates to behaviours that are undertaken because they are consciously valued. An example could be studying for exams; the behaviour is not inherently interesting, but a student may consider qualifications important to getting a good job later in life, which they recognise as a personally valuable goal. Finally, *integrated regulation* is the most self-determined form of all extrinsic regulations, and the closest to intrinsic motivation. It can be defined as the motivation underpinning behaviour that is undertaken as it helps to define who we are, and thus that is fully integrated within the self. This could include people for whom taking exercise is perceived as no effort, as being seen as "sporty" is part of their self-identity.

The continuum of self-determined motivation is at the core of applied work grounded in SDT, as it is the aim of interventions designed to bring about lasting behaviour change to find means of helping people to move along the continuum, so that their behaviour becomes more self determined. Its application is considered useful in addressing long term behaviour change such as health behaviours, for which external controls will not always be present to support maintenance over the long term. Changing behaviour is difficult, and given that the new behaviours health professionals encourage people to adopt are not usually found to be enjoyable or interesting in the initial stages (e.g., taking medication, dietary change, increased physical activity), they are not likely to be spontaneously adopted for self-determined reasons. Thus, establishing ways to promote the internalization and the integration of externally motivated health behaviours is a primary concern for research grounded within SDT (Sheldon et al., 2003).

Introjected and identified regulation are of particular interest to the study of behaviour change, as they are indicative of the extent to which internalization has taken place. Although intrinsic motivation represents the pinnacle of fully self-determined motivation, it is suggested that it is identified and not intrinsic regulation that predicts effortful behaviours. Given the conflicting demands on a person's time, intrinsic motivation alone (i.e., seeking pleasure and enjoyment) is not sufficient to prioritise a particular activity above other demands (Mullan & Markland, 1997). Identified regulation indicates that people have succeeded in internalizing their behaviour, by coming to personally endorse externally presented reasons to do so. For example, in an educational setting identified

regulation rather than intrinsic regulation has been found to predict academic performance, implying that it is associated with maintained persistence and effort (Burton et al., 2006). In an exercise setting, identified regulations have been reported to be the most important motivational regulation in predicting engagement in physical activity in university students (Wilson et al., 2004), and together with intrinsic motivation (i.e., indicating how much it was enjoyed) identified motivation for sport was found predictive of long-term persistence in the context of competitive swimming (Pelletier et al., 2001). Thus, acting through identified regulation is adaptive in terms of behavioural persistence (Ryan & Deci, 2002).

Introjected regulation is a more controlled type of motivation, and thus is associated with poorer outcomes than identified regulation, although it is still more adaptive than acting from external regulation. It is suggested that introjected regulation is adaptive to behavioural change in the short term, having an important and necessary role to play in initiating the internalization of behaviour, but that it is inhibitive over the long term (Deci et al., 1994). There is good support for this hypothesis from research in the exercise domain. In a study of exercisers attending their local gym, introjected regulation was positively associated with exercise regularity and positive self-perceptions for people who had been exercising for under six months (i.e., providing short term behavioural support), but associated with a greater likelihood of having had previous failed attempts (i.e., failure to maintain behaviour; Thøgersen-Ntoumani & Ntoumanis, 2006). Measures were only completed at one point in time in this study however, so a causal relationship cannot be inferred. More insight into the longevity of relationships is provided by a longitudinal study of the behavioural persistence of youth swimmers enrolled in a community swimming club (Pelletier et al., 2001). Introjected regulation was predictive of behavioural persistence 10 months after baseline measurements (i.e., over the short term), but there was no relationship at 22 months.

As SDT predicts, introjected regulation is associated with negative outcomes if it does persist in the longer term (Ryan & Deci, 2002). For example Hamer et al. (2002) found introjected regulations for exercise to be the strongest predictor of the maladaptive outcome of exercise dependence in a group of endurance athletes. Elsewhere, in a sample of female undergraduate students, introjected regulation for dietary control was the strongest predictor of depressive and bulimic symptoms among all motivational types (Pelletier et al., 2004). Such maladaptive outcomes of introjected motivation are hypothesised to reflect the internal conflict that results from adopting external behaviours or goals, without personally endorsing them. This is observed by the occurrence of negative cognitions such as social physique anxiety (SPA) that is associated with physical

activity maintained through introjected regulation (Thogersen-Ntoumani & Ntoumanis, 2006). Overall, evidence supports the suggestion that introjected regulation is useful in initiating behaviour, but is not a useful regulation for its maintenance.

SDT assumes that people have an innate tendency to maintain a sense of well-being and coherence, and thus individuals are oriented towards developing more self-determined forms of regulation for whatever activities they regularly take part in (Deci & Ryan, 1991). From this perspective internalization is a default process for which people need no encouragement, and thus, they are only controlled in their motivation by environments that thwart this tendency. Beyond childhood the majority of behaviour is not intrinsically motivated, and as such must first be introduced by external prompts from other people, whether they be significant others or salient reference groups. The major basis on which social contexts can be found to support or hinder internalization is largely determined by whether or not they are supportive of people's three basic psychological needs (Ryan & Deci, 2002).

#### **2.4.2 Basic Needs Theory**

Self-determination theory identifies three basic psychological needs which must be satisfied in order for people to thrive (Deci & Vansteenkiste, 2004). These needs are considered to be universal, and are distinct from people's goals for which they may well experience a "drive"; but that are not essential to well being (e.g., feeling the "need" to earn more money, Williams et al., 2000; Deci & Vansteenkiste, 2004). Needs can be satisfied or thwarted by the social context, and are pivotal to the process of internalization (Ryan & Deci, 2002). The first is the need for autonomy, which refers to a person's need for agency and to perceive oneself as the origin of one's actions. Autonomy is often considered to be the most important of the three needs, as without autonomy it is predicted that individuals will never reach the stage of internalization beyond that of introjected regulation. The second need is for competence. This not only reflects a need to feel that one is effective, but also to perceive that one has opportunities to demonstrate those capabilities and capacities. The third and final need is for relatedness, which refers to the need to feel connected to, cared for, and valued by others (Ryan & Deci, 2000c). Relatedness was the final of the three needs to be identified, and while all three are considered to be essential for optimal functioning, relatedness is not considered to play such a pivotal role as autonomy and competence in maintaining intrinsic motivation. However, it is equally important in the internalization of extrinsic motivation; new behaviours are typically prompted by other individuals, and thus are adopted partially out of a feeling of relatedness, or a desire for relatedness, and integrated within the self to gain approval from valued others (Deci et al., 1994).

The satisfaction of the three basic psychological needs is associated with a sense of well-being (Reis et al., 2000), interest in, and enjoyment of activities, and behavioural persistence (Gagne et al., 2003; Deci & Vansteenkiste, 2004). Conversely, environments which thwart these needs are associated with passive or reactive behaviour, and distress or alienation (Deci & Vansteenkiste, 2004). Need satisfaction and motivation are closely related, as in order for internalization to occur, the social context must first provide support for autonomy, competence and relatedness (Deci et al., 1994; Ryan & Deci, 2000b). However, the two constructs have been shown to have some independent effects. For example, in an intervention assessing the effect of perceived competence in addition to self-determined motivation in an aerobics class, competence had an additional effect to motivation for exercisers who were low self-determined motivation (Markland, 1999). For this group, high competence predicted better enjoyment in addition to the expected outcomes of self-determined motivation. Thus, self-determined motivation cannot be assumed to indicate the satisfaction of all three distinct needs, nor low self-determination to indicate lack of satisfaction in all three needs, and therefore both motivation and level of need satisfaction can be independently instructive in explaining people's responses to their social environment.

The satisfaction of the need for autonomy is a particularly complex issue with children and young people who may be used to, and comfortable with environments in which they are told what to do and are expected to comply. For example, in the transition to secondary school from primary school the speed of adjustment to the new school has been found to differ as a function of the degree to which the autonomy provided in the old and new learning environments differ, regardless of whether autonomy-support increases or decreases (Stoll et al., 2003). Even in adults, having too much autonomy for a given situation can be perceived just as negatively as having too little autonomy. This is demonstrated by the consistent finding that older patients have a preference for doctor-patient relationships which are low in autonomy-support, preferring not to take part in shared care plans but instead to allow their doctors to make all necessary treatment decisions (Benbassat et al., 1998; Schneider et al., 2006). Thus, it is how the environment is perceived in relation to a person's expectations and preferences, rather than objective markers of need support that is crucial for determining whether or not needs are met (Deci & Vansteenkiste, 2004). Such individual differences relating to the degree of autonomy with which a person is comfortable, relate to individual differences in autonomy orientation (Deci & Ryan, 1985b). Autonomy orientation is shaped by early social experiences, and leads people to have different perceptions of the degree of autonomy afforded by the same environment (Gagne, 2003). Therefore, in understanding the different outcomes for different individuals afforded by the same environment, the

match of the environment to an individual's autonomy orientation is an important consideration.

In a school environment, the provision of autonomy-support from teachers has been shown to enhance student engagement (Reeve et al., 2004), effort and persistence (Burton et al., 2006; Standage et al., 2006) and performance (Vansteenkiste et al., 2004a; Burton et al., 2006). From analysis of a wide range of teacher behaviours, three specific behaviours have been reported to predict the classification of a teacher as autonomy-supportive; offering encouragements, providing time for students to work in their own way, and allowing more time for students to talk (Reeve & Hyungshim, 2006). In health settings, autonomy-support has also been found to help promote and maintain behaviours, for example in enhancing the management of glycaemic control in diabetics through enhancing autonomy and competence for self-management behaviours (Williams et al., 2004), and to promote adherence to weight loss regimens predicting weight loss over a 23 month follow up period (Williams et al., 1996).

Although less of an emphasis is placed on the satisfaction of the needs for competence and relatedness, evidence from applied work grounded in SDT supports the positive effects of both of these needs. In a UK PE based study, competence was found to be the major mediating factor of the three needs in predicting interest and enjoyment in PE (Ntoumanis, 2001), and athletic competence has been found to predict sport and exercise participation over a 14 months longitudinal study (Papaioannou et al., 2006). As the third of the three needs to be defined, there is less of a research base establishing the importance of relatedness and how it can be enhanced. However, there is still support for an independent effect from that of autonomy, for example from findings reporting an independent effect of relatedness on academic engagement and performance beyond that explained by perceived personal control (Furrer & Skinner, 2003).

### **2.4.3 Goal Content Theory**

Though not a core sub-theory within SDT, Deci and Ryan have developed the allied theory of goal content to supplement their work in intrinsic and extrinsic motivation. The theory states that in addition to motives for behaviour, the content of behavioural goals is also important in predicting whether psychological needs are met (Deci & Ryan, 2000; Sheldon et al., 2004). Deci and Ryan refer to motivation and goals as the "*what*" and the "*why*" of behaviour (Deci & Ryan, 2000). The "*what*" relates to what form the motivation takes (e.g., intrinsic, identified, or external), and the "*why*" relates to the goal that an individual has in mind. The two are considered to be orthogonal, in that one can pursue the same goal (e.g., attempting to earn more money) for any type of motivational regulation. Thus, for example more money may be sought for intrinsic motives if the

money would facilitate a person to buy a home and start a family, but for extrinsic motives if it was sought to earn more than that necessary to live comfortably, whether to accumulate outward indicators of social status (e.g., a sports car) or in response to pressure from parents or a partner.

Just as motivation can be viewed as intrinsic or extrinsic, the content of goals can also be viewed as intrinsic or extrinsic (Kasser & Ryan, 1996). Intrinsic goals stem from a person's core values and are inherently rewarding to pursue (for example in developing mutually supportive relationships), and result in more positive outcomes. Conversely, extrinsic goal content relates to behaviours undertaken for some separable outcome, such as fame and wealth, usually in response to external pressures (Kasser & Ryan, 1996; Sheldon & Elliot, 1999). As such, the behaviours and contexts in which they are pursued, commonly characterised as highly competitive and reward focussed, are less likely to result in need satisfaction and more likely to compromise intrinsic motivation. There are a number of reasons why the achievement of intrinsic goals is predicted to result in greater well being; people striving for intrinsic goals are engaged in autonomous behaviour, they are likely to try harder and as such are more likely to succeed and improve their sense of efficacy and competence, and they are more likely to feel a sense of relatedness as intrinsic goals commonly involve helping others (Sheldon & Elliot, 1999). The achievement of extrinsic goals has no such positive outcomes.

The development of extrinsic goals is hypothesised to occur if a person's needs are repeatedly thwarted over the long term, causing them to develop compensatory motives, and seek alternative sources of satisfaction (Deci & Ryan, 2000). This is particularly the case when relatedness is not supported. For example, a child growing up in a cold family climate whose need for relatedness is not met may instead attempt to seek social approval through the accumulation of wealth and material possessions, which represent extrinsic goals. This relates to the finding that mainstream peer rejection predicts health risk behaviours, as adolescents attempt to find alternative sub-groups outside the mainstream with whom they can find acceptance, but in which health risk behaviours are more prevalent (Harter, 1998). While extrinsic goals may provide some short term satisfaction, they do not bring an individual closer to meeting their need for relatedness (Deci & Ryan, 2000). This hypothesis is supported by research, as for example in a study by Kasser et al. (1995) assessing maternal style in terms of warmth, democracy and control. The orientation of children towards the extrinsic goal of wealth was found to be associated with a cold, controlling, and undemocratic maternal style both at the age of four, and later in adolescence (Kasser et al., 1995).

A number of studies have been conducted to test whether the effects of goal content and motivation are independent (e.g., Kasser & Ryan, 1996; Sheldon & Elliot, 1999) rather than purely as a result of a common underlying factor such as self esteem, or cooperativeness (Sheldon et al., 2004). Sheldon et al. (1999) recorded the primary goals of a sample of college students, categorising them as either self-concordant (intrinsic) or externally generated (extrinsic). Levels of need satisfaction and well-being were tracked alongside the achievement of these goals over the course of a semester. As predicted, self-concordant goals predicted need satisfying experiences, well-being and sustained effort, which in turn predicted goal attainment. Evidence has also been reported to suggest that it is the strength of intrinsic goals relative to extrinsic goals that is important to motivation and behaviour, rather than purely the presence or absence of each type (Williams et al., 2000). Williams et al. (2000) recorded an index of the relative strength of intrinsic and extrinsic goals (the relative extrinsic aspirations index; Kasser & Ryan, 1996) in a teenage sample, alongside parental autonomy-support, and used these to predict risk-taking behaviours (i.e., use of tobacco, alcohol and marijuana). The relative strength of extrinsic to intrinsic goals was negatively correlated with both perceived parental autonomy-support, and health risk behaviours.

Goal content theory could provide a link in the proposed pathway between the changes in adolescents goals and priorities discussed in section 2, and the changes in physical activity levels observed in adolescents at this time. It provides a framework from which to conceptualise these goals, linking them to potential antecedents and consequences. From this perspective, predictions can be made with respect to the degree of need satisfaction resulting from or contributing to adolescents' existing goals to test the central research question to the present thesis. In addition, goal content theory could provide a starting point to explore whether physical activity could be framed to be more in line with the priorities of adolescence through attention to its potential for meeting adolescents' goals.

#### **2.4.4 SDT in Physical Activity Research**

As has been presented in the above discussion, SDT is a theory of human motivation that can be readily applied to practical settings. Clear relationships have been established between the characteristics of social environments, motivation, and behaviour, and research provides examples of how theoretical principles can be operationalised to conduct experimental work to bring about behaviour change. Numerous examples are present of attempts to change behaviour in relation to exercise (e.g., Pelletier et al., 2001; Vansteenkiste et al., 2004b; Wilson et al., 2005; Thogersen-Ntoumani & Ntoumanis, 2006), however work grounded in SDT appears to focus at a more micro-level than that of other studies of physical activity included in the review of interventions in section 2.3. The

majority of the studies included in the review extended beyond the manipulation of a lesson environment, for example by altering the whole school curriculum, or attempting to integrate the intervention into the adolescent's home life. Most incorporated either a practical exercise session or an educational component, which are both areas in which the psychosocial mediators of SDT have been reported to bring about significant effects. The research grounded in SDT can contribute to concrete ways in which teaching can be adjusted to promote the needs of autonomy, competence and relatedness (Gagne et al., 2003; Reeve & Hyungshim, 2006) or to promote intrinsic rather than extrinsic goals (Vansteenkiste et al., 2004b) in order to foster more self-determined motivation. In addition, SDT provides details of the types of feedback (i.e., informational and autonomy-supportive, rather than tangible and reliant on performance) that protects intrinsic motivation and predicts long term participation (Joussemet et al., 2004).



## **Section 5: Quality Of Life**

### **2.5.1 Physical Activity and Quality of Life**

So far this literature review has focused on the factors that are considered to directly impact on physical activity during adolescence, and on reporting the success of previous attempts to bring about behavioural change. However, quality of life (QoL) and physical activity have long been associated, and as a multidimensional construct that provides an insight into how each of the many domains of importance in an adolescent's life are going QoL could provide a useful adjunct to the study of physical activity in adolescence. While much work has been conducted to assess the acute effects of a single bout of exercise on well-being and to report the chronic effects of a physically active lifestyle (e.g., Gauvin & Spence, 1996), a much smaller amount of research has been carried out to link physical activity to the more stable construct of overall QoL. The work that has been carried out provides support for physical activity having a positive impact on QoL in a number of ways. The repeated positive acute effects on well-being documented to result from physical activity or bouts of exercise may contribute a cumulative effect on well-being (Sheldon & Elliot, 1999), thus enhancing one of the constituent domains of QoL. For example, research reports that emotional well-being is positively associated with involvement in sport and vigorous exercise in adolescents (Steptoe & Butler, 1996), that change in total leisure time physical activity is linked to improvements in the mental health components of QoL (Wendel-Vos et al., 2004), and that the achievement of Government physical activity targets is associated with the experience of fewer days of poor mental health (Brown et al., 2003; Brown et al., 2004). However, as sedentary but positive daily activities may equally contribute to episodes of daily well-being this relationship is unlikely to provide the full answer.

Previous research suggests that engagement in sport and exercise could also influence QoL by providing opportunities for experiences that are not available through sedentary pursuits, such as social interactions. For example, increased time spent in leisure time exercise (LTE) is associated with improvements of social functioning in adults independent of exercise intensity (Wendel-Vos et al., 2004), and social motivation (i.e., wanting to be part of a team or to be with friends) is reported to predict involvement in sport in adolescent girls (Allen, 2003). Furthermore, college students who report a high frequency of exercise have been reported to experience significantly better health, helping, and community-related QOL than those who exercise less frequently (Lustyk et al., 2004). However, from these reports alone it is not possible to discern whether involvement in sport provides experiences that satisfy QoL, or whether common underlying factors motivate individuals to both remain physically active and exhibit more

pro-social behaviour in general. Similar limitations would exist for potential relationships between good QoL and physical activity, such as physical health, so further investigation of the association, and exploration of possible causal pathways would be of interest.

The inclusion of QoL in this thesis serves several functions. Firstly, it will provide an outcome measure to test whether a common set of psychosocial mediators are associated with both good QoL and engagement in LTE. Secondly, through evaluating the relative importance of different life domains during adolescence and how these change over time, the assessment of multi-dimensional QoL can provide direct information relating to the central basis for the present thesis, i.e., that changes in adolescent exercise behaviour are related to changes in their goals and priorities. Finally, it provides an outcome measure at a global level to measure the predicted affective outcomes of need satisfaction and self-determined motivation when analysing models of behaviour change derived from SDT. This section will first define and describe the construct of quality of life, before discussing why it is considered important to the study of change in physical activity during adolescence.

### **2.5.2 Definition of Quality of Life**

Quality of life (QoL) is a broad construct for which researchers acknowledge there may be no single, universally accepted definition (Wallander et al., 2001; Rapley, 2003).

Historically, QoL was inferred from a person's objective life conditions, such as their disease status, income, life expectancy or standard of living. However, it is now widely acknowledged that such objective factors cannot be used as a substitute for subjective QoL assessment (WHOQOL, 1995b; Diener et al., 1998; Sirgy et al., 2001). Much of the impetus for this shift in conceptualisation stems from groundbreaking work in the 1940s by the World Health Organisation (WHO), which reconceptualised health from the medical model based on level of physical function and the absence of disease, to consider it as a positive and multidimensional construct (Bowling, 2005). This approach was later extended to the broader study of the factors including, but also beyond health that contribute to QoL (WHOQOL, 1995b). The WHO defines QoL as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations values and concerns." (WHOQOL, 1995b, p.1403). This definition forms the foundation for the discussion in the current work.

A person's perception of their QoL stems from their evaluation of how their life is going relative to the life domains they consider to be relevant and important at that time. This evaluation takes place through a cognitive process of assessing past experiences and making estimations of the future, and thus is reliant on subjective evaluations that need

not be firmly rooted within objective living conditions (Veenhoven, 1991). Evidence in support of a subjective basis for QoL abounds from observations that given the same objective circumstances, two people can report vastly different QoL as a function of their values and expectations (Cummins 2003; Rapley, 2003). For example, people who suffer from chronic illness or a serious disability, often report their QoL to be similar to their pre-illness levels after a period of adjustment, in the absence of improvement of function (Diener, 1997; Daltroy et al., 1999; Arnold et al., 2004). Conversely, people with relatively low level health problems, such as psoriasis, have been known to report very poor overall QoL (Skevington et al., 2006). Such findings reflect that QoL is a multidimensional construct of which different factors, or domains, are important to different people at different times (Schwartz & Sprangers, 2000; Bernhard et al., 2004). Part of its resilience is that it does not rely on the satisfaction of one life domain alone, and thus experiencing good QoL in a large proportion of domains may buffer the negative effects of poor satisfaction in one or two specific areas (Rapkin, 2000; Schwartz & Sprangers, 2000). Much as SDT suggests that people are actively motivated to integrate their environment to provide them with positive responses to daily experiences, QoL theory is based on the concept that people are oriented to construct a positive view of themselves and their life, despite difficult objective circumstances.

When people are asked what constitutes their QoL, there is a high level of convergence towards a similar set of domains (Arnold, Ranchor, Sandalman et al, 2004; Eiser, 1997; Ravens-Sieberer, Gosch, Abel, Auquier, Bellach, Bruil et al, 2001; Wallander, Schmitt & Koot, 2001). As a minimum, these incorporate the domains of physical health, psychological well-being, social relationships, and environmental factors such as neighbourhood, housing or finances (Fairclough, 2002; Wallander et al., 2001). The WHO instrument for measuring QoL, the WHOQOL, was developed simultaneously in 15 countries worldwide and as such perhaps represents the most comprehensive and universal QoL measure. It was developed by a team of international health experts from a variety of disciplines within social science and medicine, combining their own experience with previous evidence from the research literature, and importantly with consultation with patient and health professional volunteers. The resultant WHOQOL-100 consists of 100 questions within 26 facets and six domains, considered relevant by people living in all participating countries. The instrument demonstrates the extent of the breadth and complexity of QoL.

### **2.5.3 Uses of QoL Information**

QoL is acknowledged to be an important outcome measure for social and health care, both at the individual and population level (Bowling, 2005; Skevington & Gillison, 2006). Following the UK Government's 2004 Children Act, the Government established a

responsibility for children's services agencies to ensure that at-risk children not only come to no harm, but that they are also provided with opportunities to improve their well-being. To this end, children's QoL is now measured as standard when making social care assessments across the UK (Department for Education and Skills (DfES), 2003), and has been shown to be useful in making decisions about whether or not children are taken into care (Davidson-Arad & Wozner, 2001). Similarly in health care the National Service Framework (NSF) for Children includes the improvement of QoL as an outcome to measure the success of investment and a change of approach in health services (DoH, 2004). QoL can also provide a link between social and health services, as demonstrated by the recent Adolescent Mental Health Initiative supported by the Nuffield Foundation<sup>4</sup> (The Nuffield Foundation, 2005). The initiative drew together policy makers, researchers and professionals from different health and social care backgrounds to conduct research into how the effects of societal changes relating to school, stress and parenting style have an impact on adolescent QoL in the UK. Such practical projects provide acknowledgement of the multi-dimensional nature of QoL, its importance across sectors, and demonstrate a commitment to taking a multi-disciplinary approach to the measurement and application of QoL in children and adolescents. At its most powerful, the inclusion of QoL as an outcome measure in clinical trials can lead to policy recommendations such as changes to first-line drug choice or drug combinations (Efficace et al., 2003), or at the population level, provide a measure of the efficacy of changes in policy (e.g., Patrick & Erickson, 1993).

The multidimensional assessment of QoL presents a means of comparing and integrating the importance and satisfaction of the different life domains (e.g., school, peers and home) during adolescence, within the overarching assessment of "how well life is going for them." Thus, a multidimensional assessment of QoL could provide insights into which domains of life are most critical during adolescence, and how the relative importance of domains may change across development. In section 2.2 the changes brought about in adolescent goals and priorities as a result of the biological and social changes experienced during adolescence were discussed. QoL research may provide a helpful framework to explore this idea further by assessing whether there appears to be a shift in the importance of different life domains encompassed by QoL instruments during this time (DiClemente, 1996; Dogra, 2002).

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<sup>4</sup> The Nuffield Foundation is a UK charitable trust with a remit to advance social well-being through research and practical experiment initiative. It provides grants to research projects that are considered to have an impact on health or social policy or practice.

#### **2.5.4 Methodological Concerns for the Measurement of Quality of Life in Children and Adolescents**

There are a number of published articles describing good practice in the measurement of QoL both in general (e.g., Skevington et al., 1999; Scientific Advisory Committee of the Medical Outcomes Trust, 2002), and specifically in relation to children and adolescents (e.g., Wallander et al., 2001; Herdman et al., 2002). The main issues and concerns are similar for both groups. Experts concur that the accurate measurement of QoL must be based on the development of reliable and valid instruments, ensuring that the items included are meaningful to the population they are designed for, and that they provide readily interpretable scores (Eiser & Morse, 2001b; Wallander et al., 2001; Herdman et al., 2002). In order to achieve this, it is argued that measures should be developed with input from their target population, whether at the level of determining the range of appropriate facets and domains, or to the extent of commenting on the wording of items (WHOQOL, 1995b; Jirojanakul & Skevington, 2000; Herdman et al., 2002).

There is general agreement that the accurate measurement of QoL cannot be reliably achieved by simply applying adult measures and adult conceptualisations of QoL to this younger age group (WHOQOL, 1993; Eiser & Morse, 2001b; Wallander et al., 2001). Many adult measures have low reading ages to allow their completion by adults with low levels of education. However, regardless of reading age, children and adolescents may understand items differently, as life has very different priorities and meaning in childhood than in later life (Epstein et al., 1996; Kozinetz, 1999). While the majority of domains generated by adolescents are similar to those identified by adults (e.g., Ravens-Sieberer et al., 2001; Wallander et al., 2001), the facets and items within each domain (e.g. school vs. work in determining independence) may differ widely, as do the relative importance of domains in relation to overall QoL. The increasing interest in measuring children's QoL is reflected in the growing number of instruments designed and validated for children and adolescents, with established reliability (Eiser & Morse, 2001c; Meuleners et al., 2002). Taking a child-centred approach has resulted in the acknowledgement of additional domains that are not addressed by adult measures but which are crucial to a younger age group (Eiser & Morse, 2001b; Bradford et al., 2002). For example, from work carried out with Thai children the WHOQOL measure for children (CQoL) identified an additional facet of the right to speak out and to have an identity (Jirojanakul & Skevington, 2000); a Europe wide initiative to develop a child-centred QoL measure applicable to both sick and healthy children led to the inclusion of the domains of bullying, and getting on well at school (Ravens-Sieberer et al., 2005). A participatory approach is especially important to the validity of child and adolescent QoL measures where the background of research is not so extensive as it is for adults (WHOQOL, 1993).

## **Measurement of QoL by Proxy**

Many children's QoL instruments have parent or carer proxy versions (e.g., the PedsQL, Varni et al., 1999) based on the assumption that children cannot always provide reliable reports of their own QoL (Eiser & Morse, 2001a). The use of proxy measures is often considered preferable with young children (under 12) whose cognitive development is incomplete, and thus their ability to correctly conceptualise complex items and to recall events accurately over multiple days or weeks is restricted (le Coq et al., 2000). Proxy measures may also be a good alternative in assessing the QoL of severely ill patients when there is a need to minimise response burden (Schmidt et al., 2002). However, the association between child and parent measures are notably lower in less observable domains such as the social domain (Waters et al., 2003) and psychosocial functioning (Theunissen, 1998; Verrips et al., 2000; Eiser et al., 2003), and weaker in healthy, rather than sick children (Eiser & Morse, 2001a). Correlations between parent proxy and child ratings under the age of 11 are reported to range from 0.44 to 0.69 (Theunissen, 1998), those between parent proxies and 8-12 year olds from 0.04 to 0.51 (Bouman et al., 1999) and for adolescents (12-18 years) between 0.42 to 0.64 (Waters et al., 2003). However in a recent systematic review age did not differentiate between child and proxy agreement overall, providing support for the argument that proxy-measures provide different information and not just a more accurate version of the same information, which would be expected to be associated with greater agreement with older children (Eiser & Morse, 2001a). Thus, proxy reports do not provide alternative measure of children's subjective QoL, but instead provide different supplementary information.

### **2.5.5 Health Related Quality of Life**

The study of QoL largely emanated from interest in its implications in health settings, and as a result the majority of research has focussed on health-related quality of life (HRQoL) rather than overall QoL. HRQoL can be defined as the part of QoL that is influenced by health, or that could be influenced by health services (Drotar, 1998; DoH, 2001). This definition implies that HRQoL is a subset of the domains that constitute overall QoL, however there is a considerable amount of overlap between what is included in the broadest of generic HRQoL measures and overall QoL (e.g., Eiser & Morse, 2001b; Zekovic, 2003). Overall QoL can be considered a holistic construct which includes, but is not limited to health, encompassing all domains of a person's life that they consider have an important bearing on their consideration of how well their life is going overall. A potential difficulty in using HRQoL measures in place of overall QoL measures, is that many are focused towards measuring disability and the limitations imposed by poor health, rather than obtaining a positive view of a person's life. For example, the PedsQL, one of the most widely used generic HRQoL measures for children aged 8 to 18, phrases

all items of the questionnaire in a negative way; “It is hard for me to run” and “I cannot do things other kids my age can do” (Varni et al., 1999). Such items are likely to be perceived to have little relevance to healthy adolescents. More recent instruments developed using the principals set out by the WHOQOL Group, such as the Kidscreen (Ravens-Sieberer et al., 2005) and CQoL (Jirojanakul & Skevington, 2000) provide positively framed items wherever possible and appropriate. These include examples such as “Have you been able to run well?” and “Have you been able to do the things that you want to do in your free time?” Such items are likely to be perceived to have greater relevance and face validity when investigating the QoL of healthy children, in addition to providing a less discouraging experience for children with chronic health conditions.

Several comprehensive reviews of generic HRQoL measures for children and adolescents have been conducted (Eiser & Morse, 2001c; Harding, 2001; Schmidt et al., 2002; Rajmil et al., 2004). Eiser and Morse (2001b) for example conducted a review for the NHS Health Technology Assessment programme which identified 19 generic HRQoL measures which they considered reliable and valid, and provided examples of their subsequent application in research. However, only one review of overall QoL measures (as opposed to HRQoL) was identified (Pal, 1996). This review was reported prior to the publication of a number of contemporary measures, and perhaps just as importantly, prior to the rise in the more widespread practice of participatory approaches to instrument development which provide greater confidence in the validity of measures. The subsequent chapters of the present thesis aim to assess overall QoL in healthy adolescents. Therefore, a general QoL measure is required which is specifically designed for this age group, and which is oriented sufficiently towards positive health rather than functional limitations so as to be of relevance to a healthy adolescent population. None of the existing reviews provide this information. Therefore, in May 2004 prior to all studies included in the present thesis, a review of current child and adolescent QoL measures was undertaken to identify potential instruments .

## **Section 6: A Systematic Review of Quality of Life Measures for Adolescents**

### **2.6.1 Literature Research Strategy**

QoL measures for use with children and adolescents were obtained through searching the electronic databases PsychInfo, BIDS ISS, Medline (Pubmed) and Web of Science. The search terms used were “quality of life” combined with “child\*” or “adolesc\*”, and “scale or measure\*” for the period 1st January 1990, to 1st April 2004. The database searches were supplemented by examining the references sections of the articles extracted, and obtaining recent publications from identified experts in the field. In the first instance, the titles and abstracts of papers generated were screened for their relevance, and those which could be clearly excluded were rejected at this stage. Reasons for such early exclusion included reference to disease specific measures, reference to applied papers rather than presentation of scale development and validation, and work with participants outside the target age group (11 to 19 years).

Articles reporting on the development and validation of QoL measures were retrieved, and matched against the initial inclusion criteria set out below. Measures which met the criteria were then obtained, and content analysis conducted. The names of these instruments were also entered directly as search terms into the scientific databases in order to identify examples of their subsequent application.

### **2.6.2 Inclusion and exclusion criteria.**

Recommendations for sound scale development were presented in section 2.5.3. These formed the basis of the inclusion and exclusion criteria to ensure the quality of measures, within the following theoretically driven criteria:

1. *Available in the English language.* Only measures available in English were selected for review. This included instruments originally developed in other languages, providing translation and back-translation processes were documented, and that there was evidence of subsequent debriefing or discussion with the target population.
2. *Self-report scales.* In line with the acceptance that QoL is a subjective construct that cannot be accurately rated by objective indices, or by others, the search was restricted to self-report measures. Many instruments have parent or carer proxy forms, but these alternate versions were not included as they provide different information which does not always concur with child self-reports (e.g., Waters et al., 2003).



3. *Measures developed with and for 11-19 year olds.* The review was restricted to measures for 11-19 year olds, to coincide with the UK British Medical Association (BMA) definition of the age of adolescence (BMA, 2003). The majority of measures retrieved were consistent with this boundary. Recommendations for QoL measurement state that the target group for whom the measure is designed should be involved in determining the range of content, and potentially in the wording of items (WHOQOL, 1993; Skevington, 1999). To meet this inclusion criterion, measures therefore needed to demonstrate the involvement of adolescents in the development or adaptation of the measure.

Instruments put together purely from literature reviews or following consultation with proxies (parents, clinicians, youth workers) but without involvement of adolescents were excluded.

4. *Satisfactory psychometric properties.* Evidence of acceptable reliability and validity was sought according to the criteria set out by convention (Campbell & Fiske, 1959; Fitzpatrick, 1998; Eiser & Morse, 2001c). Reliability was judged from reports of internal consistency of scale items within domains and/or measures (minimum acceptable level Cronbach's alpha  $>.7$ , Cronbach, 1951), or through high correlations obtained from test-retest scores. Validity was judged from information relating to content, criterion, or construct validity. Criterion validity is demonstrated through consistency of responses between those obtained from a new measure when completed concurrently with a reliable existing measure. If the two are measuring the same construct, correlations between the same individual's scores at the same time on different measures should be high (i.e.,  $\geq .6$ , Fitzpatrick, 1998). Content validity assesses whether the scale measures what it sets out to measure, for example in ensuring that an item such as "Do you like the way you look?" (from the Kidscreen measure; Ravens-Sieberer et al., 2005) is actually measuring self-esteem as intended, rather than some other self-attribution. This is commonly assessed through qualitative means such as debriefing with target participant group and relevant experts. Construct validity is evidenced through analyses of the measure's sensitivity to differentiate between groups which are known or expected to differ in their response, or through confirmatory factor analysis (CFA) to demonstrate the statistical coherence of items to the intended constructs (e.g., domains). Sensitivity was a particularly important concern for measures extracted in the present review in order to identify instruments that do not have ceiling effects when used with a healthy population.

5. *Broad measurement of overall quality of life.* The allocation of at least one item in each of five broad domains was required for a scale to be considered global (see content analysis). This criterion was included in order to ensure that only overall QoL measures

were selected, avoiding the replication of reviews of HRQoL measures. The five domains used reflect those consistently identified as important to adolescents from qualitative and quantitative work in the extant adolescent literature (Ravens-Sieberer et al., 2001; Wallander et al., 2001). These were *physical health*, *psychological well-being*, *independence*, *social factors*, and the *environment*.

6. *Subjective Quality of Life measures*. In line with the WHO definition of QoL (WHOQOL, 1995b), measures consisting only of objective indicators of QoL (e.g., counts of the number of social contacts a week, or records of family status; cf Cummins 1997) were not sufficient to meet the criterion.

Where available, information on the responsiveness and completion time of each measure was also extracted. Responsiveness refers to the sensitivity of the instrument to change over time, and is particularly important for measures that are intended for use in longitudinal research. Instruments which begin with significant floor or ceiling effects (i.e., 90% of respondents recording responses in the highest or lowest 10% of a measure) will be unable to detect deterioration or improvement in a large proportion of respondents (Fitzpatrick, 1998). Instruments for use with a healthy sample need less concession to response burden on the basis of the poor health of participants, however it is still the case that research time is often limited and too long a questionnaire would be impractical and potentially poorly completed. Estimates of completion time were therefore included in the tables presenting each measure.

### **2.6.3 Results**

The search terms identified 93 articles describing the development or validation of 16 QoL instruments for older children and adolescents (Appendix 2.3). One additional measure was obtained through websites detailing current activities of key researchers in the field (Ravens-Sieberer et al., 2005) and another from the References section of journal articles retrieved (HAY, Bruil, 1999).

Nine instruments were excluded as they did not meet inclusion criterion five; they failed to encompass the full breadth of QoL domains. Of these nine measures, one was excluded due to the absence of the *social* domain (Steiner et al., 1998), and the remaining eight instruments did not include an *environmental* domain, and thus failed to take account of issues such as home, neighbourhood, finances and opportunities for learning and growth. While not one of the exclusion criteria, it was of interest to note that five of these eight measures also had an emphasis on functional status rather than positive aspects of well-being, suggesting that they were more oriented towards providing assessment of sick, as opposed to healthy children and adolescents, and were thus targeting HRQoL rather than

overall QoL. For example the Dartmouth COOP contains a question assessing the ability to go to the toilet unassisted (Wasson et al., 1994), and the PedsQL asks respondents to rate how much of a problem they find taking a bath or shower alone (Varni et al., 1999). This indicates there would be likely ceiling effects with healthy adolescents (full details of the excluded measures are documented in Appendix 2.3).

Five measures did not meet criterion four, as they did not involve adolescents in scale and/or item development (some of these overlapped with the excluded measures above). These were the ComQOL (Cummins 1997), TACQOL (Vogels et al., 1998), Juvenile Health and Wellness Survey (Steiner et al., 1998), Quality of Life Questionnaire for Children (Bouman et al., 1999), and YQOL-S (Edwards et al., 2002). The Nordic Quality of Life Questionnaire (Lindstrom, 1991) was rejected due to a lack of empirical data using the English version of the measure. Following the exclusion of these 12 measures, the remaining four measures underwent content analysis (Table 2.3).

### **2.6.3.1 Content Analysis**

Previous research identifies a consistently similar range of factors (domains) to contribute to adolescent QoL, although the terms used to describe them may differ. For example, similar items (whether positively or negatively framed) are included in domains labelled *Sense of Self* in the YQOL-R (e.g., “I feel alone in my life” and “I feel good about myself”; Edwards et al., 2002), as *Emotional Functioning* in the PedsQL; (e.g., “I feel sad or blue” and “I feel afraid or scared”; Varni et al., 1999), and *Psychological Well-Being* in the Kidscreen (e.g., “Have you felt lonely?” and “Have you felt sad?”; Ravens-Sieberer et al., 2005). Content analysis was conducted to allow a comparison of questionnaire content unhindered by differences in labelling. In order to employ a standard framework against which to compare the items from each extracted measure, the domain and facet definitions of the WHOQOL-100 questionnaire were employed (The WHOQOL Group, 1998). This was chosen as it contains all the domains identified as important by adolescent researchers, provides a clear and detailed manual of what is intended by each facet and domain, and represents the most comprehensive framework available for standardising raters’ classifications. Items were thus allocated to six domains: (1) *Physical*, (2) *Psychological*, (3) *Independence*, (4) *Social*, (5) *Environmental* and (6) *Spirituality, Religion and Personal Beliefs*. The first five domains were essential for classification as a sufficiently broad measure of overall QoL, as stated in the inclusion criteria. The sixth domain was retained for classification purposes, but items representing this domain were not necessary to meet the inclusion criteria as it is not a domain identified by the majority of child-centred research.

**Table 2.3 Selected Quality of Life Measures for Adolescents**

<b>Instrument No. of domains (items)</b>	<b>Age (years)</b>	<b>Reliability</b>	<b>Validity</b>	<b>Item Distribution (% of items in each domain)</b>
<b>Generic Children's Quality of Life Measure (GCQ)</b>  (Collier J, 1997)  5(25)	6-16	Internal consistency – Cronbach's $\alpha = 0.74$ to $0.78$ (each domain considered separately)	Construct validity – global score correlated with two scales, $p < 0.001$  Face validity - items developed from children's opinions.	Physical domain - 4% Psychological domain - 40% Level of Independence - 12% Social Relationships - 40% Environment - 4% Spirituality – 0
<b>KIDSCREEN</b>  (Ravens-Sieberer et al., 2001b)  10 (52)	8-18	Internal consistency: $r = 0.76$ to $0.89$	Convergent and discriminant validity – correlations up to $0.55$ reported with the frequency of physical complaints scale.  Face validity - items developed from children's opinions.	Physical domain - 8% Psychological domain - 40% Level of Independence - 4% Social Relationships - 29% Environment - 19% Spirituality – 0
<b>Quality of Life Profile- Adolescent Version (QOLPAV)</b>  (Raphael et al., 1996)  9 (54)	14-20	Initial validation - $\alpha \geq 0.80$ for each of three overarching domains, and $\alpha \geq 0.70$ for all sub-domains	Significantly correlated with other measures of self esteem, life satisfaction and social support, and alcohol and tobacco use.  Face validity - items developed from children's opinions.	Physical domain - 6% Psychological domain - 16% Level of Independence - 9% Social Relationships - 16% Environment - 47% Spirituality - 6% (* UK 32 item version)
<b>Youth Quality of Life – research version (YQOL-R)</b>  (Patrick, Edwards, & Topolski, 2002)  9 (49)	12-18	Internal consistency - $\alpha = 0.77$ to $0.96$  Test-retest (one week) $r = 0.74$ to $0.85$	Construct validity- Correlated with KINDL ( $r = 0.73$ ), Functional Disability Inventory ( $r = -0.26$ ), and Children's Depression Inventory ( $r = -0.58$ )  Face validity - items developed from children's opinions.	Physical domain - 2% Psychological domain - 17% Level of Independence - 12% Social Relationships - 37% Environment - 22% Spirituality - 5% Overall - 5%

The categorisation of items into domains was carried out independently by three raters with reference to the WHOQOL-100 manual (WHOQOL, 1995a). Each individual item was allocated to the facet to which it was judged to most closely align, regardless of the domain to which it was allocated in the host instrument. Instruments were not expected to mirror exactly the distribution of the WHOQOL-100 (as this is a relatively long instrument and designed for adults), but it was used simply to provide a framework for systematic comparison. Inter-rater reliabilities were calculated as Kappa values, providing a measure of the agreement between raters while taking account of agreement that would be expected by chance (Gwet, 2002). A rating above 0.65 is considered good concurrence, and 0.75 is considered excellent (Fitzpatrick, 1998). The results of the analysis are presented in Table 2.4, and show good to excellent concurrence between all three raters for all five dimensions (kappa=0.66 to 0.90). There was a discrepancy between allocations of 21 of the 150 items (14%), however, in each case at least two raters were in agreement. For example an item in the Kidscreen, “have you been able to run well”, was allocated to the *Independence* domain by one rater, and the *Physical Health* domain by two raters. In all of these cases the item was allocated according to the majority view. The pattern and proportion of items for which there was disagreement was similar across all instruments (12-15% of items).

**Table 2.4 KAPPA values to show inter-rater agreement for content analysis**

Instrument	Raters 1 & 2	Raters 1 & 3	Raters 2 & 3	Mean
QOLPAV	0.90	0.87	0.84	0.87
KIDSCREEN	0.90	0.73	0.81	0.81
YQOL-R	0.90	0.82	0.80	0.84
GCQ	0.88	0.75	0.80	0.81

\* a value of 0.60-0.75 is considered good, and greater than 0.75, excellent

### 2.6.3.2 Discussion of selected generic adolescent QoL measures

*Generic Children’s Quality of Life Measure (GCQ); ages 6-16 years (Collier, 1997).*

The GCQ derives its assessment of QoL from children’s views of “what makes their lives good or bad.” Items are presented as if they are being discussed among friends. The response scale represents five children who experience the emotion/event with different frequency (labelled from *always* to *never*), and participants respond to each item by indicating (1) which child they think they most resemble and (2) which they would most like to be. The questionnaire is scored by calculating the discrepancy between the two scores, reported as the sum of these totals. The clarity of the presentation of items

suggests the measure would be particularly useful for younger adolescents. Normative data have been obtained and reported on a UK sample of 842 school pupils (Collier et al., 2000), discriminating well between respondents in terms of age, SES and geographical location.

Content analysis revealed the spread of items from the GCQ to be weighted towards the social and psychological domains. Only one item loaded onto the environmental domain, one onto the physical domain, and no items onto the spirituality domain. As such it met the criterion of having items in a broad number of domains, but was the least balanced of the four measures. The majority of items are positively worded, and the estimated completion time is 30 minutes.

*Kidscreen; age 8-18 years (Ravens-Sieberer et al., 2005).*

The Kidscreen was initiated through a pan-European project involving 24 experts in 9 European countries. Ten language versions are available which were developed concurrently in each contributing country, and checked for uniformity of content through an extensive process of translation and back-translation. The Kidscreen was developed through gathering information from literature reviews, consultation with experts, and significant input from children and adolescents and their carers in each country, in accordance with the guidelines of the WHOQOL working group (Skevington, 2002). The final measure comprises 52 items, answered on a 5-point Likert scale, labelled from 1 (*not at all or never*) to 5 (*extremely or always*). The majority of items are positively framed. The scoring of the Kidscreen uses a Rasch modelling technique, which aims to increase the ease with which scores can be interpreted through adjusting individual totals according to individual response patterns (i.e., controlling for occasional anomalous responses), and expanding the scale to better discriminate between respondents at either extreme of the scale (see Appendix 2.4 for more details of this methodology).

Internal consistency reliability (Cronbach's alpha) from samples of over 20,000 children was shown to be acceptable to good ( $\alpha=.77-.89$ ; Ravens-Sieberer et al., 2005). Outside of the research domain the authors report a high demand for the instruments in different countries, for use on projects varying from basic academic research to the evaluation of interventions. Two short versions of the Kidscreen are also now available (of 27 and 10 items). Items for the long version were distributed well over the five core domains, although no item loaded on to the spirituality domain. The measure is estimated to take between 10 and 15 minutes to complete.

*Quality of Life Profile-Adolescent Version – QOLPAV; age 14-20 years (Raphael et al., 1996).*

The QOLPAV was developed in Canada through literature searches and focus groups with a healthy population of adolescents (six groups of six to eight students) and six counsellors. The instrument consists of 52 items, each of which is rated using a five point anchored Likert scale according to (1) personal importance and (2) satisfaction. The QOLPAV is longer than many other QoL inventories as each item is responded to twice. The final score is calculated by weighting satisfaction scores by importance ratings. The scale has been adapted and validated on a UK sample of 12 to 16 year olds (N= 899), resulting in a shorter 32 item version (Bradford et al., 2002).

The QOLPAV is weighted heavily towards the environmental domain, which in a recent study was found to be domain of the greatest predictive value for overall QoL within the measure (Meuleners & Lee, 2003). The majority of items were positively framed.

*Youth Quality of Life –research version (YQOL-R); age 12-18 (Edwards et al., 2002).*

The YQOL-R was developed in the United States (US) using a grounded theory approach. This methodological approach involved in-depth interviews and focus groups with adolescents (N=236) and key health professionals, to establish both the content and wording of items. The scale has good face validity and a broad focus, reflecting the views of the adolescents, their parents and youth workers. Both subjective (perceptual) items (e.g., “I feel alone in my life”) and objective (contextual) questions (e.g. “How often did you miss out on an activity due to physical problems?”) are included, and responses are reported on an 11-point anchored Likert scale (labelled from 0 “*not at all*”, and at 10 “*completely*”). A short version of the scale is also available (YQOL-S), however it was constructed of items on the basis of their importance to policy makers, so may no longer reflect the priorities and emphasis of adolescents, or statistical coherence of the original scale. Only one report of the subsequent application and performance of the full length scale has so far been published (Topolski et al., 2004), although the authors report that it is well used by clinicians in the US. Results showed good discrimination between clinical and non-clinical populations, although this assessment was restricted to a male sample. The measure has only one item loading onto the physical health domain, but there is a balanced distribution across the remainder. The majority of items are positively framed.

#### **2.6.4 Discussion**

The review was conducted with the aim of identifying broad measures of overall QoL for use with adolescents, to overcome the restrictions of using health-related measures in a well population. Overall QoL is distinguished from generic HRQoL, which assesses a more limited range of outcomes restricted to those which can be influenced by health

services and changes in health status. As such, overall QoL provides a means of extending the scope of QoL measurement beyond the field of health, whether for use in social research or for providing a more holistic view of the impact of health or treatment on the lives of adolescents. QoL measures have already been identified for their use in policy development and assessment in areas such as local governance (Higginson et al., 2003), and education (Walls & Little, 2005). Omitting the full range of domains relevant to adolescents may yield a biased, or at least incomplete, estimate of QoL, and prevent meaningful comparisons between sick and healthy populations using a measure that is relevant to both.

The current review extracted four measures of overall QoL, which were developed through child-centred techniques, report good psychometric properties, include subjective items across a broad range of domains, and are brief enough to be of practical use in research and applied settings. These are the GCQ (Collier et al, 2000), the QOLPAV (Bradford et al, 2002; Raphael et al, 1996), the Kidscreen (Ravens-Sieberer et al., 2005) and the YQOL-R (Edwards et al, 2002). Of the 14 measures extracted through the search strategy that did not meet the inclusion criteria, half were excluded as they lacked consideration of the environmental domain. Further scrutiny of the content of these measures showed a tendency to measure the lack of function rather than positive health and well-being. Therefore, combined with the absence of an environmental domain, it was considered that these represented generic HRQoL measures rather than measures of a child's or adolescent's overall QoL. The extraction of HRQoL measures through the search terms employed reflects the lack of distinction in terminology between generic health-related QoL measures, and measures of overall QoL.

Previous research concurs as to the range of different domains which should be included in a measure of overall QoL (e.g., Wallander et al., 2001; Rajmil et al., 2004). Using these criteria the current review identified four instruments which measure QoL across this full range. The content analysis revealed considerable variation in the weighting of domain across measures (see Table 2.4), which may provide a guide to researchers in selecting the most appropriate instrument for their specific research question. Sensitivity may be improved by selecting a measure with greater weighting in the domain of particular interest (e.g., the social domain, for socially related research questions) just as HRQoL measures may be more sensitive to the effects of health through weighting the ratio of items towards physical health and symptoms.



The following recommendations are made for selection of overall QoL measures with adolescents:

for combination of subjective and objective factors: YQOL-R

for brevity: Kidscreen (full or short versions) or YQOL-R

for use in multi-national research: Kidscreen

for emphasis of the social domain: GCQ or YQOL-R

for emphasis of the psychological domain: GCQ or Kidscreen

for emphasis of the environmental domain: QOLPAV

## **Overview**

This literature review has attempted to draw together the findings from adolescent health psychology, SDT and QoL to provide a background for the pathways of effects to be explored within the present thesis. It has been discussed how adolescence is a time of transition at which stage changes in cognitive style and ability coincide with biological maturity and social role changes, which are likely to bring about a shift in an individual's goals and priorities in life. It is suggested that the drop in exercise noted at this time may be partly due to this priority shift, and a number of reasons why exercise may be inconsistent with new priorities have been discussed. The following four studies will attempt to model these hypothesised effects through the theoretical pathways outlined by SDT, and to assess the assumptions that a change in priorities will accompany changes in exercise (as just one example of adolescent behaviour), through analysis of the relative importance of life domains subsumed within a multidimensional measure of QoL.



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## Changes in Quality of Life and Psychological Need Satisfaction on arrival at Secondary School.

### 3.1 Introduction

Before embarking on research to answer the main research question of this thesis, it was considered useful to test the theoretical links between constructs that will be core to the central thesis. As discussed fully in Chapter 2, the tenets of SDT have been well supported by field research linking the satisfaction of basic psychological needs (autonomy, competence, and relatedness) to self-determined motivation, and in turn to positive behavioural, cognitive and affective outcomes (e.g., Gagne et al., 2003; Standage et al., 2005a). However, while well-being in relation to need satisfaction and motivation is commonly reported at both a situational (i.e., here and now) and contextual level (from one area of life in general) (e.g., Reis et al., 2000; Sheldon & Elliot, 1999), this has yet to be extended to the more global construct of QoL.

In 1997, Vallerand conducted a synthesis of the hundreds of research studies grounded in SDT to extend the theory to account for the relationships between motivational regulations and need satisfaction and their antecedents at three different levels of generality. The result of this process was the proposed Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM). The HMIEM describes the relationships between the social context and motivation as described by SDT at three levels of generality: situational (state), contextual (life domain), and global (trait or personality). Need satisfaction is considered to be a mediator in the relationship between the social context and motivation. According to the HMIEM, need satisfaction at a particular level of generality (situational, contextual or global) can influence need satisfaction, motivation or outcomes at adjacent levels, but the association or influence will not be as strong as the relationships between effects at the same level of generality. Vallerand argued that through their influence on our cognitions, information feeds from the top down (i.e. from global to contextual, or contextual to situational levels), but also from the bottom up. Drawing from the HMIEM, QoL represents a global level construct, which encompasses well-being also at a global level, which is influenced by contextual, and more peripherally situational well-being derived from daily experiences. QoL not only encompasses an assessment of global elements of well-being, but additionally includes an evaluation of a person's satisfaction with their life as a whole. As such, QoL provides a more complete assessment of the

degree to which a significant change in one domain (e.g., school in this case) can influence a person's view of their life as a whole.

As discussed in section 2.7, valid and reliable self-report measures of QoL for adolescents are now available. Using these instruments QoL has been shown to discriminate between young people in terms of factors such as their perceived physical health, perceptions of personal control and opportunities (Meuleners & Lee, 2003). In addition, QoL is inversely related to the occurrence of adolescent health risk behaviours such as inconsistent condom use, smoking and alcohol use (Gerhardt et al., 2003). The sensitivity of QoL to differentiate between adolescents implies that overall QoL changes to reflect dissatisfaction in individual domains of life, as may take place during the process of adjustment from childhood to adolescence (DiClemente, 1996). Establishing the responsiveness of QoL to the normative changes of adolescence is important for assessing its utility as an outcome measure for further research. Further work to establish the factors which underpin good QoL, and to identify mechanisms of QoL change that may be susceptible to intervention would be useful in putting QoL information to practical use. Such information would provide a basis on which to attempt to increase the QoL of those reporting the lowest levels, or to assess the impact of interventions on an adolescent's QoL.

A time period that poses a particular challenge or threat to early adolescent well-being and QoL, is the transition from primary to secondary school (Seidman et al., 1994; Sirsch, 2003). This transition represents a significant life event for many children (Sirsch, 2003), and is linked to increased stress and depressive symptoms (Rudolph et al., 2001), poorer self-esteem (Seidman et al., 1994) and low academic achievement (Otis et al., 2005). From this list of effects, school transition would be expected to influence a number of domains of QoL, such as self-perceptions, mood and emotions, the school domain and social relationships (e.g., PEDSQoL, Varni et al., 1999). However, school transition is not always a negative experience; while some pupils perceive the move to be a threat, others perceive it positively as a challenge or opportunity (Sirsch, 2003). As such, intra-individual differences between students are likely to play an important part in the process. Several factors contribute to how well an individual deals with this transition, including self-regulatory beliefs regarding control over academic success (Rudolph et al., 2001; Seidman et al., 1994), self-concept, and social anxiety (Sirsch, 2003). Most British schools take steps to reduce the perceived threat and smooth the transition for students through simple means such as arranging for school visits with peers in the year before moving, and allocating older students as mentors (Graham & Hill, 2003; Sirsch, 2003). The present study sets out to examine the extent of change in QoL following the move

from primary to secondary school, and the consistency of direction and degree of the response across different QoL domains.

The aim of this exploratory research was to examine the relationship between changes in QoL, and change in the satisfaction of three basic psychological needs advanced by SDT (Deci & Ryan, 1985a; 1991; Ryan & Deci, 2000c). SDT is based on the premise that there are three basic psychological needs that must be satisfied by the social environment in order for human beings to thrive, and that the satisfaction of these needs will independently result in positive outcomes, such as well-being and enjoyment (Ryan & Deci, 2000a). This premise is supported by research (e.g., Gagne et al., 2003; Standage et al., 2005a). For example, well-being is reported to correspond to the degree of need satisfaction facilitated by a single sports training session (e.g., Gagne et al., 2003), and in school physical education classes a positive indirect effect for need satisfaction has been reported on positive affect, and a negative indirect effect on “unhappiness” (Standage et al., 2005a).

Although past work using constructs allied to those embraced by SDT has suggested that aspects of school transition may have a significant impact on student well-being, the satisfaction of the three basic needs set out by SDT during the transition to secondary school has, to date, not received empirical research attention. As such, hypotheses of the effect on need satisfaction must be based on research in allied constructs. For example, research in areas similar to relatedness has linked feelings of belonging and feeling connected to school to greater pro-social behaviour (Battistich et al., 2004), fewer problem behaviours (e.g., drug and alcohol use; Harrison & Narayan, 2003) and better academic performance (Battistich et al., 2004). Drawing on findings in these areas, it is plausible that relatedness may deteriorate initially during school transition due to the disruption of prior friendship groups and teacher relationships (Sirsch, 2003). Moreover, it is likely that it will take a period of time for social opportunities at the new school to emerge. Competence may be expected to decrease due to a change in academic demands (Alspaugh, 1998). The satisfaction of both relatedness and competence would be expected to improve once the school term is underway, as students adjust to their new environment, form new relationships and become familiar with teachers’ demands. Finally, perceived autonomy may be compromised if the autonomy permitted at senior school is very different from that permitted at primary school, whether it represents an increase or decrease (Stoll et al., 2003).

In the present study, hypotheses were proposed for the investigation of school transition effects in two areas. The first was in relation to the specific effects of transition to

secondary school. It was hypothesised that (a) there would be a temporary deterioration of psychological need satisfaction and QoL for a significant proportion of children, (b) that the quickest trajectory of change (improvement) would be immediately after the school transition, and that thereafter the rate of adjustment would level out, and that (c) this effect would be consistent across all QoL domains. The second area related to the association between need satisfaction and QoL. It was hypothesised that QoL changes over this period would be predicted by changes in need satisfaction. Consistent with the theoretical tenets of SDT, it was proposed that good QoL results from the satisfaction of needs, rather than vice versa. Most QoL research has been undertaken to monitor health and health care interventions, but the assessment following school transition provides a good example of a trigger for change in QoL in a healthy community population, providing evidence of the measure's responsiveness in a non-health setting.

## **3.2 Method**

### **3.2.1 Participants**

Participants comprised a single year group (Year 7) of a small co-educational comprehensive secondary school (331 students) in South West England. Pupils for the secondary school were drawn from four local Primary schools serving pupils of a similar profile, all providing for populations of below average socio-economic status, but with a low proportion (<1%) of students from ethnic minorities.

Baseline data were obtained for 76 students (57% male; mean age 11.5 years, SD=.31, range 11.1 to 12.0 years). Complete data for three repeated measures were obtained for 83% of the sample (N=63). Missing data were due to absence from class, or partial completion of the measures. Mann-Whitney *U* tests were conducted to establish whether there were differences in baseline scores for QoL or need satisfaction between those who did, or did not provide complete data. No significant differences emerged (*U* scores ranged from 258 to 303, for all tests  $p > .05$ ) therefore all analyses were conducted using data from students providing complete data only.

### **3.2.2 Measures**

*Quality of Life.* Quality of Life was assessed using the Kidscreen self-report questionnaire (Ravens-Sieberer et al., 2005), as further described in section 2.7. The Kidscreen consists of 52 items encompassing ten dimensions of QOL: physical well-being, psychological well-being, mood and emotions, self-perceptions, autonomy, family relationships, peers, school environment, bullying, and financial resources. Items are presented as questions, such as "Have you felt full of energy?", and responses recorded

on a 5-point anchored Likert scale ranging from 0 (*not at all* or *never*) to 5 (*extremely* or *always*). Adequate reliability and validity have previously been reported (Ravens-Sieberer et al., 2005). As the scoring protocol had yet to be published at the time of data analysis, negatively worded items were reversed and domain scores calculated as the mean of items within that domain as is standard practice in QoL research. QoL is considered a multi-dimensional construct, therefore change in each domain was first considered separately. Subsequently, for purposes of parsimonious analysis, an overall score was computed as a mean of all domains, expressed as a percentage.

*Need Satisfaction in the context of School.* Need Satisfaction was measured using an adapted version of the need satisfaction in the work place questionnaire (Deci et al., 2001; Kasser et al., 1992). The original scale consists of 21 items, loading onto three factors corresponding to the three basic needs of SDT. The autonomy sub-scale consisted of seven items (e.g. "When I'm at school, I have to do what I'm told"); the competence scale contained six items (e.g. "I don't feel very good at things at school"); and the relatedness scale included eight items (e.g. "People at school are pretty friendly towards me"). Responses were recorded on a seven-point Likert scale, anchored by 1 (*not true at all*) to 7 (*very true*).

While some aspects of need satisfaction and QoL are similar, need satisfaction items are presented at a contextual level, whereas QoL items are presented at a global level, which prevented duplication or overlap between the measures.

### **3.2.3 Procedure**

Ethical approval for this research was granted by the local Research Ethics Committee. Written consent was provided by the Head Teacher, and letters sent to all parents providing information and seeking passive consent. Parents of three of the 82 students opted out. The study took place during Personal and Social Education lessons (50 minutes duration), in three groups of 25 to 30. Students were informed that participation was optional, and that they could withdraw at any time without any negative repercussions (non-participating students were provided with an alternative task by their teacher). It was explained that we would ask them to complete the same questionnaires on a number of occasions, and did not expect them to remember previous answers, but to complete the items just thinking about the past week. It was emphasised that there were no right or wrong answers. To ensure that the items were clear to children of all reading abilities, each questionnaire was read aloud to the whole class by the researcher. All eligible students opted to participate, although only 76 pupils were present at the baseline data collection.

The first data collection (Time 1) took place on the second week of the first term at secondary school; as soon after the start of the new school term as was practical, allowing time to establish parental consent. Further data collection was repeated on week 4 (Time 2), and again at week 10 (Time 3), at the same time of day, and on the same day of the week on each occasion. A two week interval after Time 1 was judged sufficient to prevent recall of previous answers, yet close enough to detect a QoL response (Skevington et al., 2004).

### **3.2.4 Analysis**

Repeated measures analyses of variance (ANOVAs) with *post hoc* Bonferoni tests were used to assess the significance of change for each variable over the three time points, adopting a conservative significance level ( $p < .01$ ) in view of the repeated analyses (Sheldon et al., 2001). Bivariate correlations were calculated to examine whether there was evidence of an association between measures of need satisfaction and QoL, and subsequently linear regression analysis was carried out to predict the dependent variable (change in QoL score) from the three independent variables (change in autonomy, competence and relatedness). In line with the basic needs hypothesis incorporated within SDT, which states that the satisfaction of all three needs is necessary for optimal functioning and well-being (Ryan & Deci, 2002), all three independent variables were entered together into the regression analysis. Effect sizes ( $d$ ) of change in ratings were calculated (small effect:  $d \geq .2$ ; moderate effect:  $d \geq .5$ ; large effect:  $d \geq .8$ ; Cohen, 1988) as a method of assessing responsiveness (Fitzpatrick et al., 1998).

## **3.3 Results**

### **3.3.1 Performance of Measures**

The composite score for the Kidscreen ( $\alpha = .85$  across all individual items) and all individual domains ( $\alpha = .71$  school domain, to  $\alpha = .87$  financial domain) demonstrated acceptable internal consistency. Alphas were lower for the need satisfaction measures: autonomy ( $\alpha = .48$ ), competence ( $\alpha = .55$ ), and relatedness ( $\alpha = .70$ ). Internal reliability, however, was improved for all three subscales following the deletion of four items with low item-total scale score correlations ( $< .2$ ), (two from the autonomy, and one from each of the competence and relatedness subscales): autonomy ( $\alpha = .63$ ), competence ( $\alpha = .57$ ), and relatedness ( $\alpha = .73$ ).

### **3.3.2 Change in Ratings over Time**

In line with the predictions, all measures of need satisfaction improved over time. Table



3.1 shows mean values at each time point and the effect size ( $d$ ) of these changes. Changes did not appear meaningful between times 1 and 2, however by time 3 there were small to moderate changes in all three needs;  $d=.23$  for autonomy,  $d=.29$  for relatedness, and  $d=.45$  for competence. This change was only statistically significant for competence ( $F(2,124)=6.54, p<.005$ ), for which *post hoc* tests revealed that there were significant increases from Time 1 to both subsequent time points.

**Table 3.1 Mean values for and Need Satisfaction scores at each time point**

		Range	Mean	SD	Effect size (change from Time 1)
<b>Autonomy</b>	Time 1	2.20-7.00	4.99	1.17	
	Time 2	2.20-6.60	5.10	0.97	0.10 (no effect)
	Time 3	3.20-7.00	5.23	0.92	0.23 (small)
<b>Competence</b>	Time 1	1.00-7.00	4.99	1.08	
	Time 2	3.00-7.00	5.16	0.91	0.17 (no effect)
	Time 3	3.40-7.00	5.46	0.99	0.45 (moderate)
<b>Relatedness</b>	Time 1	2.00-7.00	5.25	1.02	
	Time 2	2.86-7.00	5.42	0.84	0.18 (no effect)
	Time 3	2.14-7.00	5.53	0.92	0.29 (small)

In line with the hypothesis, overall QoL also improved over time to a similar degree across all domains (Table 3.2). The degree of change was significant for two individual domains: psychological well-being ( $F(2,124)=8.03, p<.005$ ) and financial concerns ( $F(2,124)=6.38, p<.005$ ).

### 3.3.3 Predicting QoL from Need Satisfaction

Bivariate correlations between need satisfaction and QoL showed positive relationships on all three measurement occasions (Table 3.3). The strongest relationships were observed between measures taken on the same occasion, however, correlations were statistically significant between all time points (all  $p$  values  $<.01$ ). In line with the initial hypothesis, regression analyses showed that an improvement in QoL from baseline to Time 2 was significantly predicted by an increase in need satisfaction ( $R^2=.32, F(3,59)=9.40, p<.001$ ). Both autonomy ( $\beta=.34, p<.05$ ) and relatedness ( $\beta=.25, p<.05$ ) were significant positive predictors of change. Change in QoL from baseline to Time 3 was also predicted by change in need satisfaction ( $R^2=.36, F(3,59)=10.91, p<.001$ ), which

accounted for 36% of the variance. Again, autonomy ( $\beta = .27, p < .05$ ) and relatedness ( $\beta = .31, p < .05$ ), but not competence emerged as significant positive predictors.

**Table 3.2 Mean values for QoL (overall score and domains) at each time point**

	Time 1 Mean (SD)	Time 2 Mean (SD)	Effect size (from T1)	Time 3 Mean (SD)	Effect size (from T1)
Physical well-being,	3.67 (.76)	3.74 (.67)	0.10	3.89 (.75)	0.29*
Psychological well-being	4.05 (.63)	4.10 (.58)	0.09	4.34 (.61)	0.46**
Mood and emotions	4.08 (.61)	4.26 (.61)	0.29*	4.04 (.66)	0.06
Self-perceptions	4.01 (.72)	4.12 (.74)	0.14	4.19 (.73)	0.25*
Autonomy	3.99 (.75)	4.11 (.80)	0.15	4.12 (.78)	0.17
Family relationships	4.27 (.79)	4.33 (.80)	0.07	4.38 (.70)	0.15
Peers	3.96 (.70)	4.07(.80)	0.15	4.16 (.67)	0.28*
School environment	3.98 (.58)	4.01 (.61)	0.04	4.02 (.75)	0.05
Bullying	4.34 (.82)	4.45 (.67)	0.14	4.38 (.83)	0.04
Financial resources	3.82 (.98)	4.08 (.97)	0.27*	4.15 (.80)	0.37*
Overall Quality of Life score	80.35 (9.64)	82.57 (10.24)	0.12	83.30 (9.35)	0.30*

Note: \* indicates a small effect size ( $d > .2$ ); \*\* indicates a moderate effect size ( $d > .5$ )

**Table 3.3 Correlations between Need Satisfaction and QoL.**

		QoL score		
		Time 1	Time 2	Time 3
<b>Time 1</b>	Autonomy	.64**	.50**	.37*
	Competence	.51**	.27*	.27*
	Relatedness	.76**	.56**	.38*
<b>Time 2</b>	Autonomy		.65**	.45**
	Competence		.46**	.45**
	Relatedness		.58**	.43**
<b>Time 3</b>	Autonomy			.46**
	Competence			.57**
	Relatedness			.53**

Notes: \*  $p < 0.01$  (2-tailed); \*\*  $p < 0.001$  (2-tailed).

### 3.4 Discussion

The results of the present study demonstrate that over the first ten weeks of starting a new secondary school, students experienced a small but meaningful improvement in QoL and psychological need satisfaction. Thus, within a healthy population, QoL as measured by the Kidscreen is responsive to a significant, if normative, environmental change. The short period of time between the start of term and the observed increase in QoL ratings for this cohort is encouraging. It implies that psychological adjustment to school transition takes place relatively quickly, and that the negative impact on QoL observed for some children is short lived. These results corroborate previous findings indicating that school transition can be a significant and stressful life event for children (e.g., Rudolph et al., 2001; Seidman et al., 1994), but that most adolescents adjust quite rapidly to their new environment in terms of their well-being (e.g., Walls & Little, 2005).

Consistent with SDT and the second study hypothesis, the findings also demonstrated a coherent relationship between need satisfaction and QoL. Improvements in QoL were predicted by improvements in perceived relatedness (feeling that one is connected to and cared for by others) and perceived autonomy (the need for personal agency). As such, by extending previous research and identifying a relationship between need satisfaction and QoL in the school context, the findings suggest that need satisfaction may provide a useful foundation on which to base interventions designed to improve and maintain QoL. As the transition to secondary school involves a significant disruption of friendship groups (Seidman et al., 1994) and an adjustment in social status from most senior to most junior, the salience of social relationships and thus the importance of the need for relatedness at this time makes inherent sense. Peer relations are crucial during adolescence, as personal attributions such as self-esteem, perceived competence, and acceptance are all increasingly based on peer judgements (Craft et al., 2003; Smith, 2003). Thus, a student's perception of the quality of their peer relationships and sense of belonging would be expected to have an impact on a broad number of QoL domains. An improvement in the perception of autonomy would also be expected on starting senior school, as it is at this stage of education that students are given more choice of what to study, and take on greater personal responsibility for their work, performance, and conduct (Stoll et al., 2003).

Despite the significant associations between competence and QoL at each time-point, the regression analysis revealed that it was not a significant predictor of change. This finding is at odds with SDT, which predicts that all three needs would have an effect on psychosocial outcomes. However, it is plausible that this may be due to the success of the school's existing transition strategy in promoting perceived competence, which consisted

of liaison with primary school teachers over standards of performance and lesson content, and arranging visits to the school prior to moving. This may have enabled the majority of students to experience sufficient satisfaction of their need for competence, and hence it does not further discriminate between pupils. Alternatively, it may suggest that each of the three basic needs has a discernible and independent effect on QoL, and that it is autonomy and relatedness that are more salient during this particular life event. Future empirical work could delineate in greater detail the role that each of the three needs plays in the process of secondary school transition.

Past work has shown need satisfaction to be a malleable construct through manipulation of the social environment (Deci et al., 1994; Vansteenkiste et al., 2004b). For example, focussing lessons on co-operative learning styles, rather than competitive environments enhances satisfaction of the need for relatedness (Standage et al., 2005b); facilitating learning climates that focus on personal improvements of skills against self-referenced standards, rather than emphasising interpersonal comparisons can enhance satisfaction of the need for competence (Ntoumanis, 2001); and increasing opportunities for student input, choice, and decision making can enhance perceived autonomy (Wilson et al., 2006). Environments that are successfully manipulated to support need satisfaction lead to increased perseverance and indices of well-being such as positive mood and enjoyment (Ryan & Deci, 2000c; Standage et al., 2005b).

Although past work has linked need satisfaction to well-being at both the situational level (e.g., individual gymnastic training sessions; Gagne et al., 2003) and contextual level (e.g. towards sport in general; Reinboth et al., 2004), the present study provided a link between contextual need satisfaction and QoL at the global level. Support was found for the proposed theoretical direction of relationships between need satisfaction. However, the possibility that a good QoL might in turn lead to satisfaction of the needs in a reciprocal relationship was also tested. A significant but weaker relationship between the constructs was reported when analysed in this manner. These results are consistent with the HMIEM proposed by Vallerand (1997b), supporting to the proposal that need satisfaction at the contextual level of school, can influence the global level construct of QoL. To a slightly lesser extent, our results support the “top down” proposition that good QoL at a global level may incline a child to interpret many different contextual situations, including school, positively.

A useful secondary finding was that the Kidscreen QoL measure was responsive to change within this healthy population. Existing health-related QoL measures often show ceiling effects with healthy children (e.g., KINDL; Ravens-Sieberer & Bullinger, 1998), so

there is a need for a measure which can discriminate within this population. The responsiveness of QoL measures to significant events beyond health settings have rarely been tested in the community in general, or education in particular, where psychological well-being is as important an issue as physical well-being. A wide range of responses (43 percentage points) was reported in this sample in a group of largely healthy individuals, indicating that the instrument was sensitive enough to record meaningful effect sizes for change regardless of participants' baseline level of QoL.

### **3.4.1 Limitations.**

The study was carried out with a modest sample of students within a single school, and therefore the generalisation of results and their application to other groups may be limited. For example, the challenges of transition faced by those in a small school may be very different from those posed by a large inner city comprehensive school. While the findings of a gradual increase in QoL following school transition concur with previous research (Alspaugh, 1998), firmer conclusions could have been drawn if it had been possible to obtain pre-transition ratings from students while they were still at primary school. Such a prospective longitudinal design would allow the assessment of the degree to which QoL ratings recover to a pre-transition level after a period of adjustment, or whether they stabilise at a new baseline. However, as the present study was primarily intended as a test of the relationships between constructs rather than an exploration of the experience of school transition, the constraints of the small sample size do not preclude confirmation of the study hypotheses.

Although clear relationships were demonstrated between the satisfaction of the three basic needs advanced by SDT, the measures used were found to have lower reliability than is desirable. While recent work has been carried out to develop valid and reliable assessments of need-satisfaction for adults (e.g., Vlachopoulos & Michailidou, 2006; Wilson, Rogers, Rodgers & Wild, 2006), future work would do well to devise such measures for use with child and adolescent populations.

A further limitation is that in analysing the results of this study it has been presumed that the improvement in QoL reported solely reflects a genuine improvement in students' subjectively judged circumstances. However, improvements in QoL following a negatively perceived event (e.g., chronic illness, disability) are often reported in the absence of objective change, due to the phenomenon described as *response shift*. The theory of *response shift* proposes that after a period of adjustment, individuals experiencing a negative event are able to re-evaluate their lives to construct a more positive view, through means such as rating oneself against different comparison groups (i.e. people worse off than oneself), prioritising different domains of life (e.g. social domains above

work or physical domains), and/or recalibrating their scales of self assessment (i.e. reducing the standard of performance deemed 'acceptable' or 'good') (Sprangers & Schwartz, 1999). Response shift was not directly assessed in this study as it was anticipated that any differences in QoL ratings over this time frame would be a genuine effect, as any change in reported QoL over the period of a few weeks is likely to reflect change before or during a process of adjustment, rather than after its completion. Additionally, unlike the adjustment to a permanently poorer objective status in which response shift is typically reported (e.g., adjusting to disability) it is likely that social and academic threats really do reduce as students acclimatise to the new school and form new friendships, and are thus would be reflected in improving need satisfaction and QoL without the need for adjustment. However as this assumption cannot be discounted without an explicit test, the inclusion of a measure of response shift would be a valuable addition to future work (Schwartz et al., 2004; Sprangers & Hoogstraten, 1989). Response shift will be discussed in greater detail in Chapter 5.

The findings of this pilot study confirm both the hypothesised relationship between need satisfaction and QoL, and the responsiveness of QoL to a normative life event. These findings are important as they form a basis for the hypotheses to be specified in later chapters. The results suggest that one way in which the school context may have an effect on QoL is through the satisfaction, or lack of satisfaction for basic psychological needs. The finding that each domain of QoL responded to change in a similar fashion (i.e., all showed a small improvement), emphasises the potential impact that the frustration of need satisfaction in one domain of life (in this case school) can have on a child's overall well-being. Based on the affirmation of these assumptions, the following chapter sets out to test a more complex model of the impact of the social environment on the psychosocial mediators set out by SDT, by examining the impact of negative weight-related self-perceptions on adolescents' goals for exercise, their motivation towards exercise, and ultimately their exercise behaviour and QoL.

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# Relationships among adolescents' weight perceptions, exercise goals, exercise motivation, quality of life and leisure-time exercise behaviour.

## 4.1 Introduction

Chapter 3 provided a brief analysis of the relationship between the three basic needs hypothesised by SDT to underpin human motivation, and the global outcome of QoL. The study provided support for the premise that it is possible (and indeed could be useful in understanding the mechanisms of effects) to relate contextual level constructs such as need satisfaction in the setting of exercise, to a global measure of how a person's life is going. Having established this relationship, the present chapter aims to test a complex model of the relationship between weight-related physical self-perceptions (WR-PSPs), and both QoL and leisure time exercise (LTE), facilitated through a pathway of the psychosocial mediators proposed by SDT (Deci & Ryan, 1985a; 1991).

As discussed in section 2.1, an age-related decline in physical activity is observed between child- and adulthood which is considered to have a significant impact on physical and mental health and well-being (DoH, 2004). One factor that has been associated with a decline in physical activity levels in adolescence is poor body image and body dissatisfaction (Neumark-Sztainer et al., 2006). Adolescence (in addition to early adulthood) is an age characterised by increased self-awareness which marks the onset of body dissatisfaction, that many experts consider is now normative for British adolescents (Dohnt & Tiggemann, 2006; Strelan et al., 2003). This is reflected in an associated increased risk of the development of eating disorders (Stice et al., 2000) and a tendency among adolescents who are of a healthy weight, especially girls, to consider themselves to be overweight (Brenner et al., 2004; Goodman et al., 2000). Although many adolescents recognise exercise as a means for weight control (Mulvihill et al., 2000; Sabiston et al., 2007), it is by far the least common approach to coping with poor body image (e.g., Boutelle et al., 2002; Crocker et al., 2003). Instead weight loss attempts are more commonly associated with unhealthy weight loss practices such as fasting, self-induced vomiting, and use of laxatives (Boutelle et al., 2002; Ricciardelli et al., 2000). Exercise therefore potentially represents a very positive means of weight control particularly in the many cases of weight control attempts by adolescents who are not overweight and thus, for whom weight loss itself would bring no health benefit, as it diverts attention away from dietary restraint and possible associations with pathological eating practices (Littleton &

Ollendick, 2003; Ricciardelli et al., 2000). Given that a large proportion of adolescents are concerned about their weight, and recognise a positive role for exercise in tackling this, why is it that body dissatisfaction in adolescence is associated with lower, rather than higher levels of physical activity and exercise (Neumark-Sztainer et al., 2006)?

Some insight to this question may be provided by the application of SDT (Deci & Ryan, 1985a; 1991). SDT suggests that in addition to the importance of motivation (that is *why* a person takes part in a certain activity), *what* goal a person aspires to achieve from the activity is important for motivational consequences (Deci & Ryan, 2000). As discussed more fully in Chapter 2 (section 2.4.3), the content of behavioural goals (i.e., the “*what*”) can be categorised as intrinsic or extrinsic, both of which have very different outcomes for motivation and behaviour (Deci & Ryan, 2000; Kasser & Ryan, 1996). Intrinsic goals stem from a person’s core values, and typically promote self-determined motivation to result in behavioural persistence and well-being (Sheldon et al., 2004; Vansteenkiste et al., 2004b). Conversely, extrinsic goals stem from aims to achieve outcomes separable from the activity itself, and usually foster more controlling forms of regulation, resulting in poorer levels of well-being and behavioural persistence (Deci & Ryan, 2000). Thus, if body dissatisfaction leads to the development of extrinsic, weight-related goals for exercise this may provide some explanation for the lack of persistent engagement in this potentially useful behaviour in coping with poor body image.

In exercise settings, the goals of health, fitness, social relationships and enjoyment have all been described as intrinsic goals, whereas exercising to improve physical appearance and to lose weight are characteristic of extrinsic goals (Furnham & Calnan, 1998; Vansteenkiste et al., 2004a). Past work has demonstrated that some of the precursors to these extrinsic goals for exercise begin to emerge at or around puberty, particularly for the extrinsic goal of weight management (Strelan et al., 2003). These include increased perceptions of pressure from others to lose weight or be thin (Wardle et al., 2002), and the increase in the importance attributed to physical appearance and perceived physical competence (Furnham & Calnan, 1998; Smith, 2003).

A variable which has been shown to reflect body related concerns, and one that has implications for exercise participation is *social physique anxiety* (SPA; Hart et al., 1989). SPA refers to the degree to which a person becomes anxious when they perceive their physique to be evaluated negatively by others (Hart et al., 1989). Previous studies have demonstrated a link between SPA and exercise goals and motivation. Using a sample of university students, Frederick and Morrison (1996) reported that exercisers who were high in SPA were more likely to endorse extrinsic motives for exercise than those low in SPA.



Likewise, in a sample of adult exercisers negative correlations between SPA and self-determined forms of motivation were reported, alongside positive correlations with amotivation and controlled forms of extrinsic motivation (Thøgersen-Ntoumani & Ntoumanis, 2006). Because SPA directs the individual's focus towards an outward marker of self (i.e., it represents an external indicator of worth), it was hypothesised in the present study that SPA would be positively associated with external goals. In contrast, it was hypothesised that SPA would be negatively related to intrinsic goals.

A final but important consideration in research relating to exercise and self-perceptions in adolescence is that of gender. Significant gender differences would be expected not only in rates of physical activity (reported to be greater in boys; Department of Health [DoH], 2004a), but also in the psychosocial correlates of weight status. Specifically, in past work adolescent girls have reported higher levels of dissatisfaction with their weight (Sweeting & West, 2002), greater levels of SPA (Smith, 2004), and an increased awareness of media pressure to lose weight than boys (Stice et al., 2003). However, while the mean values reported for each construct may differ as a result of gender, it was expected that the pattern of relationships between the constructs (i.e., the consequences of poor body image) would remain similar. As such, consistent with past work (Ntoumanis, 2001; Standage et al., 2005a), it was hypothesised that the model would display measurement invariance. Such reasoning and testing of assumptions is important when examining theoretical models of motivation such as SDT which assume universality in the relationships between constructs across factors such as gender. The establishment of measurement invariance across gender groups is also important for the interpretation of findings and implications for practice.

As discussed in section 2.4.3, previous work grounded within SDT has reports that goal content does not only influence outcomes through the mediating effects of motivation, but also has an independent direct effect (Deci & Ryan, 2000; Sheldon et al., 2004; Vansteenkiste et al., 2004a). Thus, in understanding the effects of negative WR-PSPs on exercise it is envisaged that assessing their relationship with exercise goals, in addition to exercise motivation will provide a greater explanation of the variance than through the consideration of the impact on motivation alone.

Leisure-time exercise (LTE) is a commonly used behavioural indicator of volitional motivation (e.g., Chatzisarantis et al., 1997; Hagger et al., 2005), selected as it represents activities over which adolescents have a choice, rather than mandatory forms of exercise such as PE or the activities of daily living. As such, it was anticipated that it would provide a measure of the part of physical activity behaviour which is a function of the students'

level of motivation rather than their school or home environments. In addition to LTE, it was considered pertinent to measure a second dependent variable to assess the psychosocial outcomes of the proposed pathways of effects, as WR-PSPs are associated with poor well-being and affect in addition to decreased exercise behaviour. Experimental studies in both SDT (Gagne et al., 2003), and exercise disciplines (Norris et al., 1992; Standage et al., 2005a) commonly measure well-being, which is an acknowledged component of QoL. Well-being is a useful measure in situational contexts and experimental studies as it is responsive to change brought about by the manipulations of an intervention. However, in the present study which aimed to capture a constant underlying attribute rather than measure day to day change, the more stable construct of QoL was selected. As such, the use of QoL as a dependent variable provides an interesting extension to previous work. Aligned with the tenets of SDT, it was hypothesised that self-determined motivation would positively predict participants' LTE and their reported QoL.

The present study was conducted in two parts. The first part aimed to investigate the relationship between WR-PSPs and the outcomes of LTE and QoL, mediated through the psychosocial mediators of exercise goal content and motivation at a cross-sectional level (Figure 4.1). Cross-sectional analyses are useful in establishing the relationships between variables at a given point in time to assess the hypothesised associations (e.g., Ntoumanis & Blaymires, 2003; Standage et al., 2005a). However, a longitudinal approach is needed in order to study hypothesised causal relationships and to assess the longevity of outcomes (e.g., Edmunds et al., in press-a; Pelletier et al., 2001). Thus, the second part of the present study aimed to assess the persistence of hypothesised relationships over time, by repeating measurements with the same sample of adolescents one year later. In addition, the assessment of change over time rather than on a single occasion enabled the examination of the factors within environmental contexts which support or inhibit the dynamic process of internalization (Deci et al., 1994). A one year period was chosen to provide an opportunity for hypothesised changes in motivation and behaviour to take place, and to provide a reference point consistent with that used in other research. In addition, it provided control for seasonal effects, given that time 1 data collection was carried out during the winter (January to March, 2005) when adolescents are likely to be less active than during warmer months.

Part 1 tested a hypothesised model of the pathway of associations through structural equation modeling (SEM). The model predicted that (a) individuals who perceive both that they are overweight, and pressure from others to lose weight, will experience greater SPA, (b) perceived pressure to lose weight and SPA will positively predict extrinsic

exercise goals, and negatively predict intrinsic exercise goals, (c) the impact of goal content on the outcomes of LTE and QoL will be partially mediated by self-determined motivation. The examination of complex models tested through SEM are useful in establishing whether a hypothesised set of associations fit well to the data. However, the areas of interest in the present study were a more detailed assessment of associations between different levels of variables within the model over time, rather than the fit of the model as a whole. For example, it was planned to investigate whether different factors are predictive of the extremes of very high, compared with very low levels of LTE, and to assess to what extent effect sizes of change reflect meaningful differences to the individual. Therefore, the analysis in part 2 was disaggregated to explore each phase of the model independently, using different statistical techniques as appropriate. The following series of hypotheses were tested:

*Hypothesis 1: Leisure-time exercise and quality of life will decline over the one year follow-up period.*

Previous literature suggests that physical activity levels decline during adolescence, particularly for girls (Nelson et al., 2005). Similarly, there is some evidence, though not unequivocal, that QoL diminishes with increasing age during adolescence (Bisegger et al., 2005; Drukker et al., 2006). In line with this previous literature, it was therefore predicted that both LTE and QoL would decrease between time 1 and time 2.

*Hypothesis 2: Need satisfaction at time 1 will be a positive predictor of self-determined motivation at time 2.*

Within SDT, the satisfaction of three innate basic needs is considered to be an essential prerequisite for self-determined behaviour and the process of internalization (i.e., the ability to adopt behaviours prompted by valued others, or promoted through societal norms; Deci et al., 1994; Ryan & Deci, 2000b). As the persistence of this relationship is central to the two subsequent hypotheses, hypothesis 2 set out to test whether this relationship endured over time.

*Hypothesis 3: Changes in LTE and QoL will be predicted by time 1 need satisfaction, and change in self-determined motivation.*

In line with SDT, it was hypothesised that levels of psychological need satisfaction and change in self-determined motivation would predict future LTE and QoL (Ryan & Deci, 2002). SDT suggests that the satisfaction of all three psychological needs is necessary for optimal functioning (e.g., positive behavioural, cognitive and affective outcomes), and to provide support for a person's innate tendency to internalize behavioural motivation (Ryan & Deci, 2000c; 2002). The present hypothesis provides a test of this proposed

sequence of consequences. It was predicted that time 1 need satisfaction would result in positive effects on the time 2 outcomes of LTE, and QoL, and that these effects would be mediated by an increase in self-determined motivation.

*Hypothesis 4: The experience of (a) negative weight-related self-perceptions and (b) extrinsic goal content at time 1 will predict poorer LTE and QoL one year later. This effect will be mediated through need satisfaction and self-determined motivation.*

The fourth hypothesis extended the analysis to include the first phase of the model tested in Part 1. It examined whether the effects of (a) poor WR-PSPs (perceiving oneself to be overweight, experiencing SPA and body dissatisfaction) and (b) having extrinsic goals for exercise, persisted beyond a single time point to predict LTE and/or QoL one year later (mediated by need satisfaction and motivation). Specifically, it was predicted that negative WR-PSPs and extrinsic goals would compromise need satisfaction in an exercise setting, and thus have a negative impact on self-determined motivation. The effects on need satisfaction and motivation at time 1 would subsequently mediate the negative effect of WR-PSPs on LTE and QoL at time 2.

## **4.2 Method**

### **4.2.1 Participants**

Participants were recruited by school. In order to carry out the analysis in part one of the study through structural equation modelling, a sample size of five participants per parameter to be estimated is recommended (Bentler & Chou, 1987). The hypothesised model (Figure 4.1) included 24 estimated parameters, indicating a sample size of 120. In order to conduct a test of gender invariance, this sample size was needed for each sex. Additionally, to ensure sufficient numbers would be available for analysis allowing for non-completion of questionnaires and drop out over the year to follow up, a full sample of 600 adolescents was sought. A list of the nine co-education senior schools within the local education authority was obtained, and schools were approached sequentially through the list until the sample size was achieved. Four schools were recruited to take part, all of which were situated in small towns in rural areas, with low numbers of pupils from ethnic minorities (<1%). Two schools served pupils of lower socio-economic status than the national average (e.g. entitlement to free school meals [FSM] was above average at 13% and 9%), while the remaining two schools served pupils with an above average socio-economic status (entitlements to FSM 6%). School size ranged from 855 to 1431 pupils.

Prior to the collection of data, consent to conduct the study was issued from the local Research Ethics Committee. In line with British Psychological Society guidelines (2000),

head teachers were then approached in the first instance, and those interested in taking part asked to provide written consent for pupils to participate. All students within the target year group were eligible to take part (Year 9). Letters were posted home to parents, informing them of the study, and asking them to contact the school or research team only if they preferred their child not to take part (passive consent). Twelve parents withheld consent. Finally, when the research was presented and explained to the students themselves, it was made clear that the research was not obligatory, and that they could withdraw at any time without any negative effects on their schooling. Verbal consent was obtained at this point. All remaining pupils agreed to participate in the questionnaire study, although 60 (21 males, 39 females) did not consent to being weighed. A one-way ANOVA was conducted to determine whether there were significant differences in baseline factors (age, body satisfaction, gender) between those adolescents who refused to be weighed, and those who agreed. The analysis was conducted with the between subject variable of sex, and the within subject variables of body satisfaction and age. There was a significant difference between the two samples in terms of body satisfaction only ( $F=(1, 664)=32.07, p<.001$ ) which accounted for the difference in refusal rates between genders (21% in boys and 38% in girls).

The initial sample constituted 665 Year 9 students, 52% male, with a mean age 14.08 years (range 12.67, to 15.33 years). However, complete data at time 1 was provided by only 580 students (male  $N=300$ , female  $N=280$ ), with a mean age of 14.06 (SD .32; range 13.05 to 15.33 years). The results for the cross-sectional analysis are therefore reported for these participants only. Complete data on the two occasions was collected for 356 of the original sample (male  $N=180$  (51%), female  $N=176$  (49%); mean age at time 2=14.93 years (SD=.30)). The high drop-out rate was partly caused by one of the four schools involving 157 students at time 1 withdrawing from the study due to the employment of a new Head of PE who no longer wished to be involved. Other drop-outs were caused by usual absences from school, and failure to provide complete data ( $N=150$ , 30%). No students who were present in school on the day of data collection at time 2 and had participated at time 1 subsequently withdrew from the study.

#### **4.2.2 Procedure**

The study was introduced by the principal investigator who reminded participants that there were no right or wrong answers to questionnaire items, and of their right to withdraw at any time. Data collection was conducted with the pupils either in form groups (one school), or prior to PE in groups of up to 70 (i.e. two classes at a time) in the school hall. At both time points pupils were first guided through the LTEQ questions to ensure correct understanding, and subsequently completed the remaining questionnaire packet independently at their own pace while the researcher remained available to answer arising

questions. Pupils were asked to bring their completed questionnaires to a separate room/partitioned area where weight and height were measured privately so as to avoid embarrassment. Teachers were on hand to provide assistance in ensuring quiet conditions were maintained and questionnaires completed independently, but all assistance in questionnaire completion and height and weight measurements was undertaken by the research team to ensure confidentiality and consistency.

### **4.2.3 Measures**

The measures listed below were combined onto a single questionnaire (Appendix 4.1).

*Leisure-Time Exercise.* A short self-report activity questionnaire was chosen to minimise the response burden for participants, in the form of the Leisure-Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985). The scale assesses the frequency of physical activity at three different intensities; mild, moderate and strenuous. Test-retest reliability of the LTEQ has been established with adolescents, and found to be consistent regardless of recall ability (Sallis et al., 1993). While only low-to-moderate associations have been reported with adolescents in a validation trial with the Caltrac accelerometer (Kowalski et al., 1997), such findings are of a comparable magnitude to other self-report measures in this population (Koo & Rohan, 1999). Previous work conducted within the SDT framework reported positive correlations between the LTEQ and need satisfaction, and correlations with different motivational regulations in the directions indicated by theory (i.e., a negative correlation with external regulation, and the strongest positive correlation with identified regulation) (Edmunds et al., in press-b).

*Quality of Life.* QoL was assessed using the Kidscreen self-report questionnaire, as described in Chapter 3 (section 3.2.2). Responses were indicated on a five point Likert-type scale anchored by 1 (*never*) to 5 (*always*) for 52 items, loading onto 10 domains. Scores were transformed using the Rasch model as recommended by the scale authors, which is a process that transforms non-discrete raw data into a scale where the intervals have greater meaning (see Appendix 2.4 for further details). In the present work, the alpha coefficients for domains ranged from .78 to .90 (following reversal of scores for negatively framed items). In line with recommendations of the scale authors, a composite QoL score was computed by obtaining an average score across all domains for certain analyses (The Kidscreen Group, 2006).

*Weight Status.* Weight status was assessed through Body Mass Index (BMI; kg/metres<sup>2</sup>). BMI can provide a means to approximate weight status using age and sex adjusted percentiles, and is the standard classification system for defining overweight at a population level. To permit the calculation of BMI scores, weight was measured without

shoes in light clothing on portable electronic scales (Omega 873, Seca Ltd.), and height measured with a portable stadiometer (Leicester Height Measure, Seca Ltd.).

*Weight Perceptions.* Participants were asked to rate their perceived weight status using a single item taken from the US National Longitudinal Study of Adolescent Health (Pesa et al., 2000). This required participants to class their current weight as underweight, slightly underweight, about right, slightly overweight or overweight. The item has since been found to discriminate between adolescents according to ethnicity, pubertal stage, and self-esteem in a female sample (Crissey, 2006).

*Perceived Pressure to Lose Weight.* Perceived pressure to lose weight was measured through six items modified from Ricardelli, McCabe and Banfield (2000) relating to perceived pressure from parents, friends and the media to (a) be thin and (b) lose weight. The items were developed following qualitative work with 12 to 15 year old boys, and the structure validated through factor analysis with a sample of 444 students from grades 7 to 10 (McCabe & Ricciardelli, 2001). Adequate test-retest reliability ( $\alpha=.84$  for girls and  $.80$  for boys) and significant correlations with the related constructs of body dissatisfaction ( $r=.38$ ), weight importance ( $r=.19$ ) and the use of strategies to lose weight ( $r=.67$ ) were reported with a further younger sample (8-11 years) (McCabe & Ricciardelli, 2001).

*Social Physique Anxiety.* SPA was assessed using the Social Physique Anxiety Scale (SPAS; Crawford & Eklund, 1994). Initial reliability and validity statistics were established with an adult sample, however a shorter 9 item version has since been found to have good internal reliability with an adolescent population (mean age=15; female  $\alpha=.87$ , male  $\alpha=.85$ ) (Smith, 2004). This version was used in the present study. Responses were indicated on a five point Likert-type scale anchored by 1 (*not at all*) to 5 (*extremely*). In the present work, the alpha coefficient was  $.80$ .

*Intrinsic/Extrinsic Goals.* Exercise goal content was measured using the Reasons for Exercise Inventory (REI; Silberstein et al., 1988) which consists of 23 items distributed between seven factors; fitness, mood, health, enjoyment, weight control, to be more attractive, and to improve body tone. In line with previous research (Furnham & Calnan, 1998; Vansteenkiste et al., 2005a), items within the first four factors were categorised as intrinsic (e.g. "to have fun"), and those in the final three factors classified as extrinsic (e.g. "to lose weight"). Responses were indicated on a seven point Likert-type scale anchored by 1 (*not at all*) to 7 (*extremely important*). Internal consistency of the same two factor solution (termed 'positive' and 'negative') has previously been reported with a sample of 235 UK pupils with a mean age of 16.8 years (positive:  $\alpha=.94$ ; negative:  $\alpha=.84$ ) (Furnham

& Calnan, 1998). A test of construct validity was provided through correlations with measures of body dissatisfaction; the three factors comprising extrinsic goals (weight, tone and attractiveness), but not those comprising intrinsic goals, correlated significantly with body dissatisfaction. Alpha coefficients in the present work were .90 and .88 for the intrinsic (positive) and extrinsic (negative) subscales, respectively.

*Need Satisfaction.* Need satisfaction in an exercise context was measured through three five-item measures previously used with adolescent samples to assess autonomy (Standage et al., 2003a), competence (McAuley et al., 1989) and relatedness (Richer & Vallerand, 1998). The alpha coefficients for the measures were .90, .89 and .95 respectively.

*Behavioural Regulations.* Motivation towards exercise was measured using the Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2, Markland & Tobin, 2004). This scale comprises 19 items relating to the five types of regulation identified by SDT (from least, to most self-determined: amotivation, external regulation, introjected regulation, identified regulation, and intrinsic motivation). Responses were indicated on a five point Likert-type scale anchored by 0 (*not true for me*) to 4 (*very true for me*). Adequate factorial validity and reliability has been reported for this measure in an adolescent sample (Gillison & Standage, 2005). In the present work, the alpha coefficients were .82, .76, .74, .74, and .87, for amotivation, external regulation, introjected regulation, identified regulation, and intrinsic motivation, respectively.

For the purpose of examining the hypothesised model in the cross-sectional analysis, and consistent with past work (Niemic et al., 2006; Vallerand et al., 1997), weights were assigned to the motivational items according to their respective location on the self-determination continuum, to form an index labelled *self-determined motivation*. This index was created by using the formula recommended by Markland et al.: (amotivation x -3) + (external regulation x -2) + (introjected regulation x -1) + (identified regulation x 2) + (intrinsic regulation x 3).

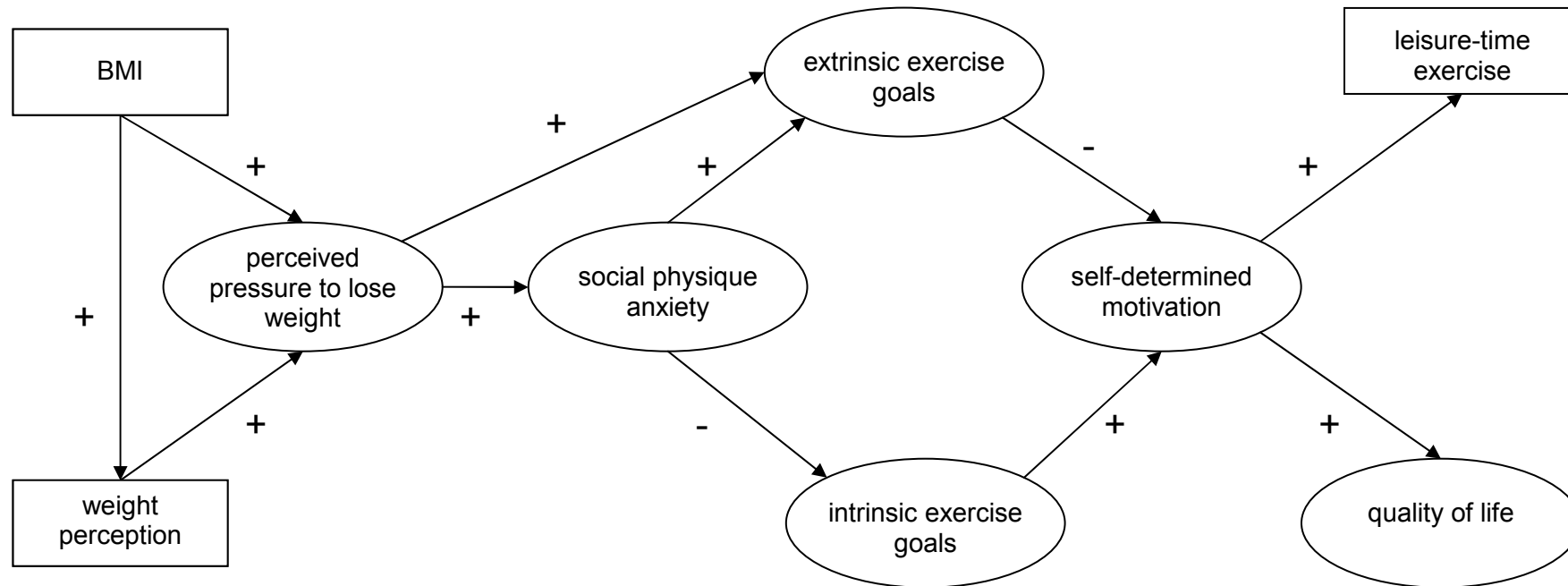
#### **4.2.4 Analysis**

##### **4.2.4.1 Part 1: Cross-sectional data**

Descriptive statistics were calculated separately for males and females. Differences across gender were explored using t-tests and Chi-Square tests. The adequacy of the theoretical model (see Figure 4.1) was tested via structural equation modelling (SEM) using AMOS Version 6.0 (Arbuckle, 2003). The maximum likelihood estimation (*mle*) method was used in conjunction with the bootstrapping procedure due to the presence of



Figure 4.2 Hypothesised model of association between WR-PSPs, LTE and QoL



non-normal data (Mardia's multivariate coefficient of 16.65). Due to the large number of parameters to be estimated, a parcelling technique was used in place of a full latent analysis of the hypothesized model which has been used in previous research testing complex models of motivational processes (e.g., Reinboth et al., 2004). Parcels were created by randomly allocating items to form two indicators for each latent factor, with the result that the necessary ratio of approximately 5:1 participants per estimated parameter was maintained (Bentler & Chou, 1987). SEM assesses the fit of a hypothesized model to the variance and covariance matrices of the data, producing statistical indices which report on the disparity between the two. A number of indices are usually selected on which to base decisions of acceptable or unacceptable fit, as many vary in their accuracy according to sample size, and there is no single gold standard (Hu & Bentler, 1999a). The adequacy of fit to the model in the present study was judged on the basis of generally accepted thresholds of the following fit indices: the Comparative Fit Index (CFI) and Incremental Fit Index (IFI), which both compare the fit of the model to a hypothetical case in which all variables are unrelated; the Standardized Root Mean Square Residual (SRMR) which calculates the average differences between the sample and estimated variances and covariances; and the Root Mean Square Error of Approximation (RMSEA) as a measure of absolute fit. A model that fits the data well, should generate values close to or greater than .95 for the CFI and IFI, and values of (or less than) .08 and .06 for the SRMR and RMSEA, respectively (Hu & Bentler, 1999a).

The model was also tested for equality of constraints across gender using multi-sample invariance analysis in line with an established procedure (Bentler, 1995). Although it is common to consider a non-significant  $\chi^2$  value to indicate invariance between two nested models, it is now commonly accepted that this index is sample size dependent and too stringent a criteria (Marsh et al., 1998). Therefore, the assessment of change in the absolute and incremental fit indices was again used to provide an indication of gender invariance (Bentler, 1995). Constraints were first applied to factor loadings (regression coefficients), then factor variances and covariances, and finally path coefficients (structural regression paths). The conventional final step of setting residual variances to equivalence was not conducted in this analysis, as it is excessively stringent and not considered an essential test of equivalence (Tabachnick & Fidell, 2001).

#### **4.2.4.2 Part 2: Longitudinal analysis**

Three types of analysis were conducted to test for the duration of effects reported at a cross-sectional level in order to fully explore the nature of long term associations.

### 1) Categorical analysis

The degree of change in LTE and QoL over the follow-up period was classified into one of four categories. This method was selected to assist in the ease of interpretation of findings, as the mean score for either scale has minimal inherent meaning: LTEQ scores are presented in METS (metabolic equivalents), which is a measure of physical activity relating to the ratio of the working metabolic rate of an activity divided by the resting metabolic rate (one MET represents the metabolic rate of an individual at rest). The Kidscreen scores are transformed from a standard percentage into a distribution based on the Rasch model (see Appendix 2.4). In addition, there are acknowledged limitations in using self-report measures to calculate exact exercise levels, and as such the use of broader categorisation may be more conservative (cf., Shephard, 2003; DoH, 2004b). LTE was categorised according to Government guidelines for physical activity, for which the threshold is set as at least one hour of moderate intensity exercise every day (DoH, 2004a). Participants were thus classified into one of four groups: sufficiently active for health at both time points (termed *maintainers*), active at time 1 but inactive at time 2 (termed *drop-outs*), inactive at time 1 but active at time 2 (termed *take-ups*), and inactive on both occasions (termed *avoiders*; see Table 4.1).

**Table 4.1 Predicted levels of need satisfaction and motivation, for each exercise classification group**

Classification	Time 1			Time 2		
	Need satisfaction	Motivation	LTE	Need satisfaction	Motivation	LTE
Maintainers	<b>High</b>	<b>High</b>	<b>High</b>	<b>High</b>	<b>High</b>	<b>High</b>
Drop-outs	<i>Low</i>	<b>High</b>	<b>High</b>	<i>Low</i>	<i>Low</i>	<i>Low</i>
Take-ups	<b>High</b>	<i>Low</i>	<i>Low</i>	<b>High</b>	<b>High</b>	<b>High</b>
Avoiders	<i>Low</i>	<i>Low</i>	<i>Low</i>	<i>Low</i>	<i>Low</i>	<i>Low</i>

There are no acknowledged cut-off points to determine *good* QoL, however, the Kidscreen Group suggest a criteria for determining *poor* QoL at half a standard deviation below the mean. In line with these recommendations, participants were categorised as having *good* or *poor* QoL, where the term *good* is intended to imply good enough QoL (i.e., not poor) rather than referring to highly scoring individuals. In recognition that the mean QoL score may vary over time (as a result of either response shift or true change in QoL), the threshold for poor QoL was estimated separately at time 1 and time 2, such that QoL was

considered in relation to the peer group at that particular point in time. Using this threshold to classify good, or poor QoL at each time-point, participants were categorised into one of four groups: (1) no change, good QoL on both occasions, (2) improvement in QoL from poor at time 1 to good at time 2, (3) deterioration of QoL from good at time 1 to poor at time 2, or (4) no change, poor QoL on both occasions.

Change in categorisation over time was assessed using Chi-square tests ( $\chi^2$ ), and differences in the means between and LTE and QoL groups were compared using a one-way ANOVA. The degree to which the between groups differences were meaningful was assessed through the calculation of effect sizes (Fitzpatrick, 1998), using Hedges  $g$  to weight for unequal sample size (Hedges, 1981).

## 2) *Mixed modeling of change over time*

Change in QoL over time was assessed for each of the ten individual QoL domains using a mixed modeling procedure<sup>5</sup>. This method was chosen in line with recommendations to use this version of ANOVA for analysis of repeated measures which contains no between-subjects variables (Cnaan et al., 1997). The analysis is conducted by estimating the extent of group differences while allowing individual response patterns to vary, through testing a linear model comprising both fixed (i.e., time) and random effects (i.e., individual differences) (Verbeke & Molenberghs, 2000). Thus, rather than comparing the difference between paired outcomes at two time points as is the case in other simpler repeated

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<sup>5</sup> At the first stage, the individual's vector of change over time ( $Y_i$ ) is computed. This is composed of the product of the known effects of covariates over time ( $Z$ ; e.g., experimental condition) and a regression coefficient representing the effect specific to that individual ( $\beta_i$ ), plus a residual term representing the unexplained variance ( $\epsilon$ ). Thus, for participant  $i$ , the first stage models the equation  $Y_i = Z_i\beta_i + \epsilon_i$ . The second stage of the analysis involves modeling  $\beta_i$ , the regression coefficient that is allowed to vary for each specific individual.  $\beta_i$  is computed from the product of a matrix of known individual level covariates ( $K_i$ ; e.g. gender, baseline attributes) and a vector of unknown regression parameters ( $\beta$ ), plus a further residual term ( $b$ ). As such, for participant  $i$ , the second stage models the equation  $\beta_i = K_i\beta + b_i$ . The final value for  $Y$ , the mean vector of change across individuals is computed by substituting the second equation into the first, effectively allowing the modeling of an individual's trajectory of change based on individual differences, in addition to the effect of known covariates such as treatment effects, across all individuals. The effect of this process is to reduce the error that remains unexplained by the model ( $\epsilon$ ), thus increasing the power of the analysis. In the present study, a very basic model was tested, for which the group level covariate ( $Z$ ) and the individual level covariate ( $K$ ) both represented the effect of time, such that the effect of time on the group as a whole was computed, controlling for the variance in individual response patterns.

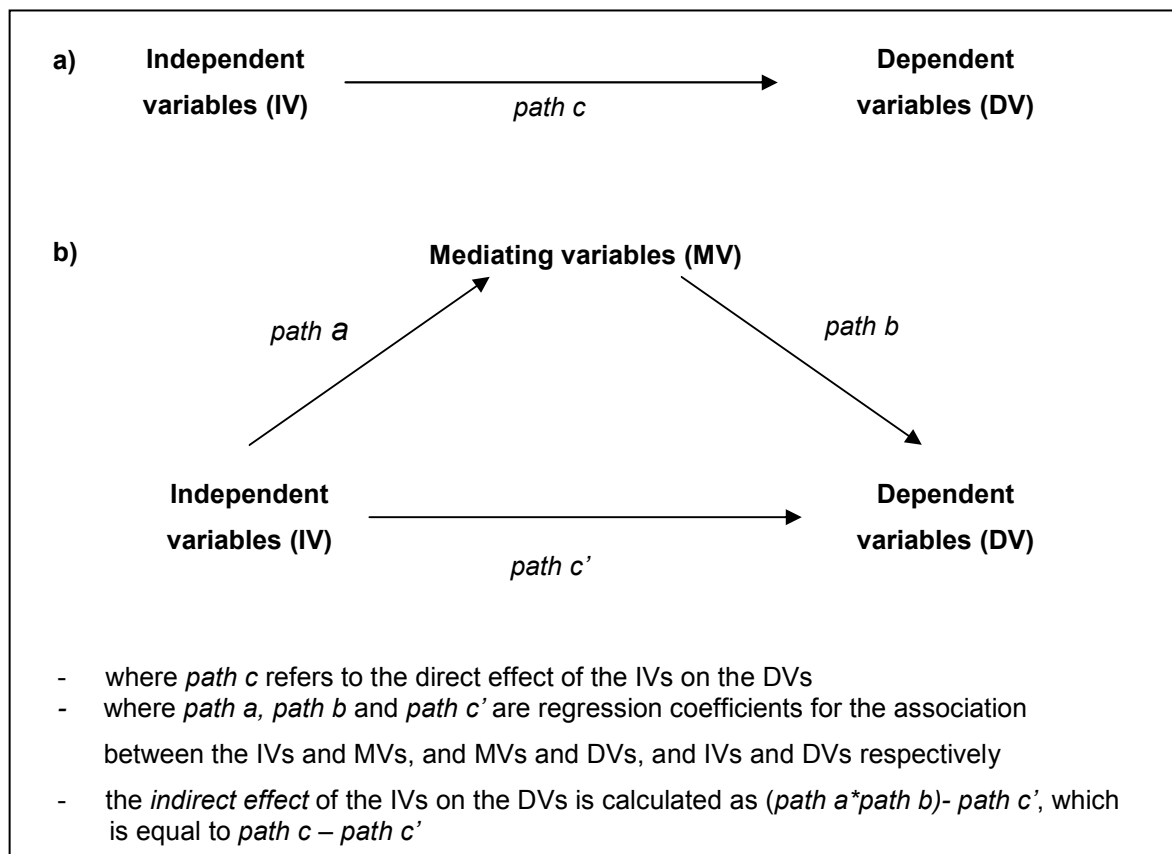
measures designs, mixed modeling tests a linear model that predicts an individual's outcome at time 2 from their initial score, combined with the effect of time on all scores. The main advantages of mixed modeling are the ability to deal with missing data without deletion of cases, and greater power to detect an effect (Keselman et al., 2001). Greater power is achieved by reducing the degree of error unaccounted for in the model, through modeling both individual and group level effects (Cnaan et al., 1997; Keselman et al., 2001). The data were analysed using the mixed modeling commands available in SPSS (version 14).

### 3) *Mediation Analysis*

Mediation between time 1 factors and time 2 outcomes were investigated through Baron and Kenny's established causal steps procedure (Baron & Kenny, 1986, see figure 4.2). Through this approach, mediation is established by demonstrating; (i) a significant correlation between independent and dependent variables, (ii) a correlation between independent variables and proposed mediating variables, (iii) an association between mediating variables and dependent variables, and (iv) that when controlling for the mediating variables, the relationship between independent variables and dependent variables is either reduced to zero (full mediation) or significantly reduced (partial mediation).

The demonstration of mediation through causal steps alone has been criticised for lacking power (MacKinnon et al., 2002; Shrout & Bolger, 2002). Current recommendations suggest the addition of a supplementary statistical test of the extent of the indirect effect (i.e., whether it differs significantly from zero; cf. Preacher & Hayes, 2004). The indirect effect of the independent variable on the dependent variable ( $c'$  in Figure 6.1) is quantified as the remainder of extent of the direct association (i.e., correlation coefficient  $c$ ) that is not explained by the effect brought about through mediating variables (the product of  $a*b$ ) and is termed the *coefficients strategy* (cf. Preacher & Hayes, 2004). A bootstrapping procedure was used to estimate the true population coefficient from the sample coefficient by selecting 1000 random samples from the full data set (with replacement), and constructing a confidence interval (CI) for the true estimate from the bootstrap samples (Preacher & Hayes, 2004). As there were multiple mediators proposed in each analysis (i.e., three basic needs, and five forms of motivational regulation) the effect was analysed using a bias corrected bootstrapping approach appropriate for multivariate mediation, by adjusting the centre point (median) of the bootstrap samples to coincide with the coefficient initially calculated for the full sample (Preacher & Hayes, 2004).

**Figure 4.2** Diagram of pathways referred to in Baron and Kenny's (1986) causal steps of mediation



In the present analysis the independent variables were represented by WR-PSPs or exercise goal content, the mediating variables were need satisfaction variables and motivational regulations, and the dependent outcomes LTE and QoL. Finally, a hierarchical regression analysis was conducted to assess the relative importance of all potential mediators in predicting the dependent variables. A hierarchical approach was used to retain the theoretical coherence of the relationships between independent variables (cf., Tabachnick & Fidell, 2001) as employed in previous research which has combined need satisfaction and motivational regulation in regression models (e.g., Edmunds et al., in press-b). Baseline scores were entered into the equation as a first step of the analysis as these were expected to have the greatest explanatory power of the outcome at time 2. Need satisfaction variables were entered as a second step into the equation as they are expected to be indirectly associated with behavioural and affective outcomes through motivational regulations, which were themselves added in the third stage of the analysis. The final step in the analysis was to add WR-PSP variables or exercise goal content into the equation, to assess whether they could add additional explanatory power to the model.

In all analyses, results were judged to be non-significant (NS) if  $p > .05$ . Effect sizes (Hedges  $g$ ) were considered to be large if above .80, moderate if above .50, small if above .20, but not to be meaningful if below .20. Partial eta squared was used to calculate effect sizes in ANOVA analyses, which represents the amount of variance which is accounted for by the effect.

## 4.3 Results

### 4.3.1 Descriptive Statistics

Descriptive statistics for the participants providing full data at both time points are summarised in Table 4.2 to 4.4. At time 1 boys engaged in significantly more exercise per week than girls ( $t=6.59$ ,  $df=578$ ,  $p<.001$ ,  $g=.55$ ), averaging ten sessions of moderate or strenuous exercise per week, compared with six to seven sessions for girls. Government guidelines (DoH, 2004a) recommend adolescents take at least one hour of moderate to vigorous activity every day for optimal health. From the frequency data obtained using the LTEQ (adding time spent in PE), approximately 76% of boys, but only 48% of girls took enough exercise to meet these guidelines. Contrary to the first hypothesis in Part 2 there was very little change in LTE for either sex at time 2; 76% of boys and 47% of girls were classified as sufficiently active for health (Table 4.2).

**Table 4.2 Proportion of respondents classified as active/inactive according to government guidelines at each time point**

		<b>Time 2 inactive</b>	<b>Time 2 active</b>	$\chi^2$ (df)
<b>Time 1 All pupils</b>	inactive	78 (56%) avoiders	61 (44%) take-ups	29.946 (1,1) $p<.01$
	active	59 (27%) drop-outs	158 (73%) maintainers	
<b>Time 1 Male</b>	inactive	16 (34%) avoiders	31 (66%) take-ups	3.173 (1,1) NS ( $p=.08$ )
	active	28 (21%) drop-outs	105 (79%) maintainers	
<b>Time 1 Female</b>	inactive	62 (67%) avoiders	30 (33%) take-ups	16.377 (1,1) $p<.001$
	active	31 (37%) drop-outs	53 (63%) maintainers	

Similarly, there was little change in the proportion of participants overall reporting good or poor QoL (Table 4.3), however there was again some considerable variation at an individual level.

**Table 4.3 Proportion of participants experiencing change in QoL over time.**

	Time 2, good QoL (N=256, 62%)	Time 2, poor QoL (N=100, 28%)	$\chi^2$ (df)
<b>Time 1 good QoL</b> (N=252, 71%)	216 (86%)* Group A	36 (14%) Group B	81.38 (1,1), p<.001
<b>Time 1 poor QoL</b> (N=104, 29%)	40 (38%) Group C	64 (62%) Group D	

Note: \*percentages in brackets indicate values for that row

Table 4.4 shows the change in prevalence of overweight and body-related concern for the 356 pupils providing data at both time points. BMI was used to categorise participants as either not-overweight, or overweight (including obese) as defined by sex and age (in months) adjusted international percentiles (Cole et al., 2000). The proportion of students classified as overweight and obese did not alter significantly for either sex over the year of the study (it remained between 19 to 22% on both occasions). At time 1 girls perceived more pressure from the media to lose weight than did boys ( $t=-6.6$ ,  $df=578$ ,  $p<.001$ ,  $g=.40$ ) but not from friends or family, and experienced greater SPA ( $t=-8.5$ ,  $df=578$ ,  $p<.001$ ,  $g=.66$ ). As expected as a result of the changes in body composition associated with maturation (Neovius et al., 2004), there was a significant increase in BMI for boys ( $t(168)=-5.93$ ,  $p<.001$ ,  $g=.29$ ) and girls ( $t(151)=-4.77$ ,  $p<.001$ ,  $g=.16$ ). Despite a consistency in objective weight status, the proportion of adolescent girls perceiving themselves to be overweight decreased (47% to 37%;  $z=-2.683$ ,  $p<.01$ ,  $g=.20$ ), while the proportion of boys judging themselves to be overweight remained the same. SPA was the only WR-PSP to increase significantly, and did so only for girls ( $t=(173)2.28$ ,  $p<.05$ ,  $g=.16$ ). Girls reported a poorer QoL than boys ( $t=3.0$ ,  $df=578$ ,  $p<.005$ ,  $g=.18$ ) at time 1, and this did not change over time.



**Table 4.4 Mean values, and prevalence of weight-related self-perceptions at both time points**

	Male			Female		
	time 1	time 2	Effect Size <sup>b</sup> (g)	time 1	time 2	Effect Size (g)
BMI (SD)	20.23 (3.33)	21.24 (3.09) †	.29	21.10 (3.73)*	21.72 (3.85) †	.16
SPA	2.57 (.72)	2.58 (.71)	.01	3.11 (.87)*	3.24 (.90) †	.16
Body satisfaction	3.15 (.86)	3.18 (.79)	.04	2.82 (.91)	2.80 (.93)	.01
N (%) <sup>a</sup> overweight	22 (13)	19 (11)	.57	22 (14)	20 (11)	.42
N (%) obese	10 (6)	17 (9)	.16	10 (6)	14 (8)	.08
N (%) perceiving themselves overweight	47 (28)	47 (28)	.09	82 (47)*	64 (37) †	.20
N (%) healthy weight perceiving overweight	21 (12)	36 (20)	-	46 (26)	47 (27)	-
N (%) overweight not perceiving a problem	5 (3)	24 (13)	-	5 (3)	19 (11)	-
N (%) dissatisfied with weight	37 (22)	36 (22)	.09	78 (44)	70 (41)	.02
N (%) reporting weight control goals	19 (11)	19 (11)	0	36 (21) †	34 (19) †	.01
N (%) reporting physical appearance goals	41 (22)	42 (23)	.11	52 (30)	51 (29)	.02
N (%) reporting exercise to improve muscle tone	37 (21)	48 (27)	.01	49 (28)	48 (27)	.07

Note: \*significant difference over time ( $p < .05$ ); † = significant gender difference; <sup>a</sup> N varies across analyses due to missing data; <sup>b</sup> effect size is of difference over time

In order to meaningfully interpret the goal content data, participants were classified as holding a particular exercise goal if they responded with *very* or *extremely* on the 7 point rating scale. Overall, the most commonly reported goals for boys were fitness (36%) and health (33%; both intrinsic), and for girls the intrinsic goal of health (26%), plus the extrinsic goals of body tone (27%) and attractiveness (26%). Overall girls reported exercising for extrinsic goals more frequently than boys, and intrinsic goals less frequently. Specifically, girls were significantly more likely to report goals of weight control (22% vs 10%,  $\chi^2(1) = 17.0$ ,  $p < .001$ ) and body tone (27% vs 20%,  $\chi^2(1) = 4.1$ ,  $p < .05$ ), but significantly less likely to report goals of fitness (17% vs 36%,  $\chi^2(1) = 25.9$ ,  $p < .001$ ), and mood regulation (5% vs 10%,  $\chi^2(1) = 5.2$ ,  $p < .05$ ) than boys. Exercise goal content did not change significantly for either sex over time.

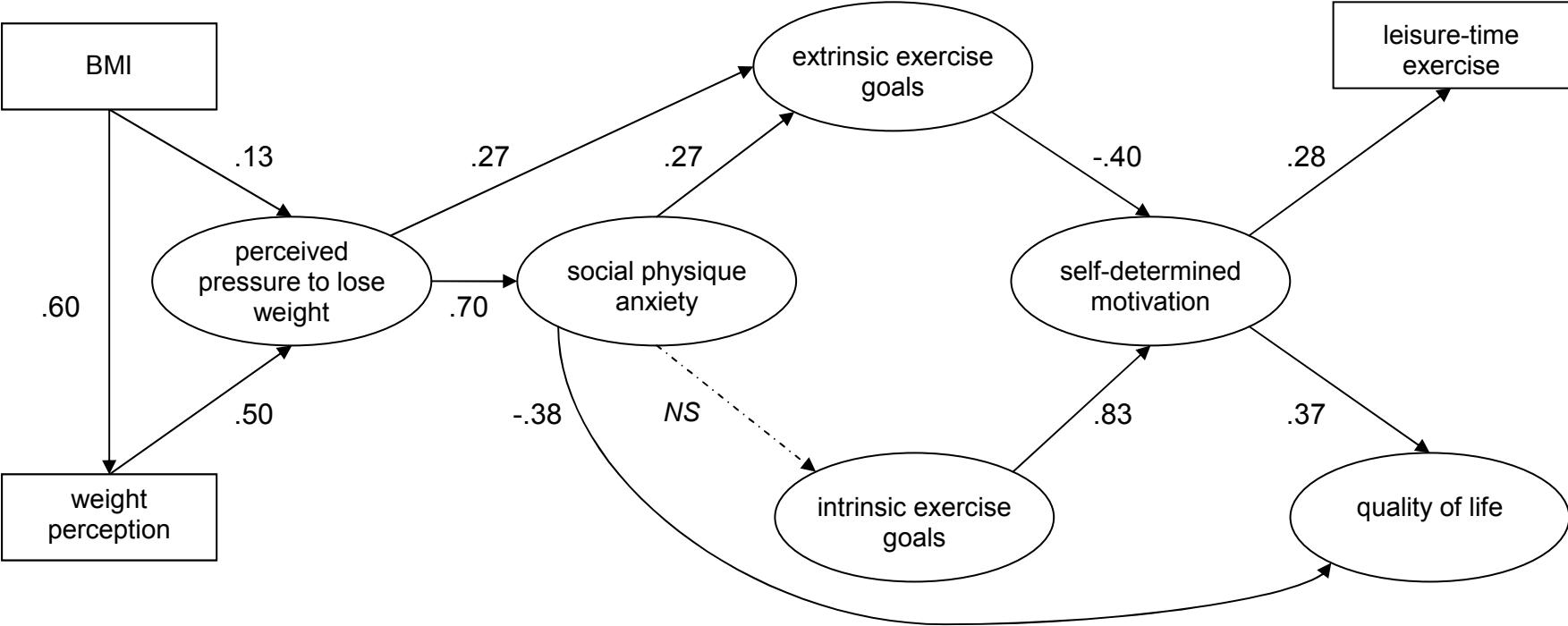
A two-way factorial ANOVA was conducted to examine the potential interaction effect of time and sex on the weight-related variables. The interaction was not significant for any outcome. There was a significant effect of gender on body satisfaction ( $F = 22.10$ ,  $p < .001$ ,  $\eta^2 = .06$  [moderate]) and SPA ( $F = 62.53$ ,  $p < .001$ ,  $\eta^2 = .15$  [large]) which were poorer in both cases for girls. There was a significant effect of time on BMI, which increased for both sexes ( $F = 53.51$ ,  $p < .001$ ,  $\eta^2 = .14$  [large]).

#### **4.3.2 Part 1: Cross-Sectional Results**

The results for the hypothesised model using SEM showed a reasonable fit to the data ( $\chi^2(96) = 684.5$ ,  $p < .01$ ; CFI = .90; IFI = .90; SRMR = .158; RMSEA = .103 [.096-.110]). However, modification indices suggested that the disturbance terms of intrinsic and extrinsic goals be allowed to covary, and that a path between SPA and QoL be added. In implying that individuals experiencing greater SPA have poorer QoL this path was added to the model as it is in accordance with existing theory (Crocker et al., 2003). The re-specified model showed a marked improvement in fit to the data ( $\chi^2(94) = 291.5$ ,  $p < .01$ ; CFI = .97; IFI = .97; SRMR = .057; RMSEA = .060 [.053-.068]). The standardised solution for the final model is presented in Figure 4.3.

The re-specified model was then used as a baseline for the gender invariance analysis. The statistical indices showed acceptable fit for both sexes (Table 4.5). With the exception of the path between BMI and perceived pressure to lose weight in girls, all individual paths remained significant. This path was therefore unconstrained for all subsequent invariance analyses, and in line with the specification approach described by Byrne (2001) was instead estimated freely for boys, and constrained to zero for girls. The two baseline models were then tested for partial invariance, which can be assumed if changes in the absolute and incremental fit indices following each constraint were minimal

Figure 4.3 Final cross-sectional model of relationships between WR-PSPs, exercise goals, motivation, LTE and QoL



Note. For visual simplicity, measurement terms (thetas and epsilons) are not shown. All solid paths are significant (i.e., their z scores are greater than 1.96).

**Table 4.5** Sequential fit indices for Gender Invariance Model

<b>Constraints imposed</b>	$\chi^2$	<b>df</b>	$\Delta \chi^2$	$\Delta$ <b>df</b>	<b>CFI</b>	<b>IFI</b>	<b>SRMR</b>	<b>RMSEA (90% CI)</b>
<b>Unconstrained</b>	372.05	188	-	-	.97	.97	.059	.041 (.035-.047)
<b>Measurement weights</b>	403.13	196	31.08	8	.97	.97	.059	.043 (.037-.049)
<b>Measurement intercepts</b>	514.33	210	142.28	22	.95	.95	.074	.050 (.045-.056)
<b>Structural weights</b>	643.12	221	271.08	33	.93	.93	.065	.057 (.052-.063)
<b>Structural intercepts</b>	662.53	223	290.49	35	.93	.93	.065	.058 (.053-.064)
<b>Structural residuals</b>	694.25	232	322.209	44	.92	.92	.069	.059 (.054-.064)

(Marsh et al., 1998). These were sufficiently small for the invariance model to be retained with acceptable fit.

Finally, the hypothesis that the effect of exercise goal content on activity levels and QoL would be mediated by self-determined motivation was explored using bootstrap generated bias-corrected confidence intervals (cf. Preacher & Hayes, 2004). The results showed exercise goal content to have significant indirect effects on both LTE and QoL via self-determined motivation. Specifically, standardised indirect effects emerged for extrinsic goals on reported LTE ( $\beta = -.11$  (90% CI =  $-.16$  to  $-.08$ )), and on QoL ( $\beta = -.15$  (90% CI =  $-.19$  to  $-.11$ )). Likewise, standardised indirect effects for intrinsic goals emerged on reported LTE ( $\beta = .24$  (90% CI =  $.19$  to  $.30$ )) and QoL ( $\beta = .31$  (90% CI =  $.25$  to  $.38$ )). The beta weights indicating path strength for the final model across gender are presented in Table 4.6.

**Table 4.6 Standardised Beta Weights for the final model separated by gender**

Path		Male	Female
BMI	→ Perceived weight status	.67	.51
BMI	→ Perceived pressure	.20	.10
Perceived weight status	→ Perceived pressure	.33	.60
Perceived pressure	→ SPA	.60	.75
Perceived pressure	→ Extrinsic goals	.18	.19
SPA	→ Extrinsic goals	.13	.37
SPA	→ QoL	-.41	-.39
Extrinsic goals	→ Motivation	-.41	-.37
Intrinsic goals	→ Motivation	.85	.80
Motivation	→ QoL	.37	.36
Motivation	→ LTE	.22	.37

### 4.3.3 Part 2: Longitudinal Results

#### **Hypothesis 1: Change in leisure-time exercise and QoL levels over time**

In line with published research which reports lower exercise levels in adolescent girls than in boys (Caspersen et al., 2000; Fox & Riddoch, 2000), change in LTE was assessed separately for each gender. The proportion of the sample sufficiently active for health did not change significantly over time, and therefore hypothesis 1 was not supported. However, there was considerable movement of individuals from one group to another (i.e., active to inactive, or vice versa) over the year, especially among the girls. One third of adolescent girls changed their exercise levels over the period of one year (Table 4.2), with 37% of girls active at time 1 classed as inactive one year later, while 33% of inactive girls became active. Only 21% of active boys reported becoming inactive one year later, whereas 66% of those who were initially classified as inactive increased their exercise levels to be classified as active by time 2. Although the hypothesis was not supported, the characteristics of those who changed their exercise levels in either direction and those that managed to remain active, is of interest from the perspective of analysing the mediators of behaviour change. These will be explored in hypotheses 3 and 4.

Table 4.7 shows the time 1 and time 2 QoL domain scores, to allow a domain by domain comparison of QoL over time<sup>6</sup>. No gender differences were found so the analysis were conducted on the whole sample. The significance of changes in each domain were analysed using a repeated measures mixed modelling design. A significant deterioration in perceived QoL was observed for two domains: physical health, and self-perceptions. A significant improvement was reported in the domain of bullying (i.e., a decrease in self-reported bullying). However, all three significant differences were of a small effect size. The other seven QoL domains assessed remained relatively stable across time. Thus, there was only limited support for the hypothesis that QoL would deteriorate over time, observed for only two specific QoL domains.

#### **Hypothesis 2: Need satisfaction at time 1 predicts motivation at time 2**

Partial correlations were conducted to assess the size of the association between need satisfaction at time 1 and motivation at time 2, controlling for baseline motivation. To gain a complete picture of the association of effects, each of the five motivational regulations was analysed separately. The partial correlations (controlling for baseline motivation) are shown in Table 4.8.

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<sup>6</sup> Time 1 scores have been adjusted for a potential *response shift* in QoL self-reports. Response shift and the process by which scores were adjusted is the focus of Chapter 5 of the present thesis.

**Table 4.7 Comparison of time 2 and retrospective time 1 QoL scores by domain, with results from mixed linear model analysis**

QoL domain	Time 1 <sup>a</sup> Mean (SD)	Time 2 Mean (SD)	Mixed Modeling F test	Effect Size (g) <sup>b</sup>
<b>Physical health</b>	3.40 (1.01)	3.26 (1.00)	$F(1,262)= 5.88^*$	-.14
<b>Psychological well-being</b>	3.57 (1.00)	3.64 (1.03)	$F(1,256)= .90$	.10
<b>Moods &amp; Emotions</b>	2.91 (1.12)	3.08 (1.03)	$F(1,252)= 2.16$	.10
<b>Self Perception</b>	2.95 (1.21)	2.69 (1.13)	$F(1,246)= 12.71^{***}$	-.23
<b>Autonomy</b>	3.72 (.92)	3.65 (1.05)	$F(1,265)= 1.84$	-.05
<b>Family relationships</b>	3.61 (1.15)	3.51 (1.25)	$F(1,258)= 3.21$	-.05
<b>Peers</b>	3.86 (.95)	3.92 (.91)	$F(1,256)= .80$	.08
<b>School</b>	3.39 (.97)	3.29 (.99)	$F(1,269)= 1.46$	-.06
<b>Bullying</b>	3.04 (1.16)	3.29 (1.06)	$F(1,243)= 16.09^{***}$	.25
<b>Financial</b>	3.60 (1.05)	3.59 (1.17)	$F(1,268)= .07$	.04

Note: \* $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

a – *thentest* scores adjusted for response shift, see Chapter 5

b - estimate of size of time effect; small  $g > .2$ , moderate  $g > .5$ , large  $g > .8$

Controlling for baseline motivation, all three measures of need satisfaction correlated negatively but weakly with time 2 amotivation and external motivation. Need satisfaction correlated weakly but positively with introjected regulation, but stronger significant positive associations were found with identified and intrinsic regulations. The associations were similar for all three basic needs, although slightly weaker in each case for relatedness. The results therefore support the hypothesis that the satisfaction of basic needs at time 1 is indicative of greater self-determined motivation at time 2. The lack of a significant negative relationship between need satisfaction and more controlling forms of motivation (i.e., introjected and external) or on amotivation suggests that for this sample, the potential undermining effect of poor need satisfaction on controlling motivation as outlined by SDT was minimal.

**Table 4.8 Partial correlations between time 1 need satisfaction ratings, and time 2 motivational regulations, controlling for baseline motivation.**

	<b>Autonomy</b>	<b>Competence</b>	<b>Relatedness</b>
<b>Amotivation</b>	-.09	-.06	-.07
<b>External regulation</b>	-.09	-.07	-.05
<b>Introjected regulation</b>	.05	.04	.03
<b>Identified regulation</b>	.14**	.17**	.11*
<b>Intrinsic regulation</b>	.19***	.23***	.13*

Note: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Hypothesis 3: Changes in LTE and QoL will be predicted by time 1 need satisfaction, and change in self-determined motivation.**

The third hypothesis stated that changes in LTE and QoL would be predicted by baseline need satisfaction and subsequent changes in self-determined motivation. Consistent with the tenets of SDT (Ryan & Deci, 2002; Deci & Vansteenkiste, 2004), Hypothesis 3 was operationalised for both LTE and QoL as follows:

- a) A good outcome at both time points (i.e., classified as active, or reporting good QoL) would be associated with consistently high levels of need satisfaction and self-determined motivation.
- b) Deterioration in outcome would be predicted by a mismatch between high self-reported LTE/QoL and poor need satisfaction at baseline. Motivation would be expected to deteriorate from time 1 to time 2.
- a) Improvement in outcome would be predicted by a mismatch between low self-reported LTE/QoL and high need satisfaction at baseline. Motivation would be expected to shift from more controlled, to more autonomous regulation over time.
- b) Poor LTE or QoL at both time points would be associated with consistently low levels of need satisfaction and self-determined motivation.

Details of the mean need satisfaction and motivation scores for each LTE group at time 1 are shown in Table 4.9, and differences at time 2 are displayed in Table 4.10. Mean values for QoL at each time point are shown in table 4.11 and 4.12. The significance of the differences between groups was analysed using one-way ANOVA with post hoc Bonferroni tests to examine the hypothesised group differences.



**Table 4.9 Comparison of need satisfaction and motivation between exercise change groups at time 1**

	<b>Group A</b> <i>Maintainers</i> (N=158) <i>Mean (SD)</i>	<b>Group B</b> <i>Drop-outs</i> (N=59) <i>Mean (SD)</i>	<b>Group C</b> <i>Take-ups</i> (N=61) <i>Mean (SD)</i>	<b>Group D</b> <i>Avoiders</i> (N=78) <i>Mean (SD)</i>	<b>ANOVA</b> <i>df=(3,352)</i>
Autonomy	5.16 (1.14)	4.66 (1.24)	4.69 (1.18)	4.15 (1.48) <sup>A</sup>	<i>F=12.02; p&lt;.001</i>
Competence	5.03 (1.19)	4.26 (1.28) <sup>A</sup>	4.60 (1.40)	3.74 (1.38) <sup>A<sup>C</sup></sup>	<i>F=18.85; p&lt;.001</i>
Relatedness	5.14 (1.06)	4.34 (1.32) <sup>A</sup>	4.88 (1.23)	4.37 (1.29) <sup>A</sup>	<i>F= 10.79; p&lt;.005</i>
Amotivation	0.25 (0.54)	0.42 (0.72)	0.57 (0.96) <sup>A</sup>	0.56 (0.75) <sup>A</sup>	<i>F=4.90; p&lt;.005</i>
External regulation	0.69 (0.79)	0.88 (0.89)	0.61 (0.64)	0.77 (0.69)	<i>F=1.51; NS</i>
Introjected regulation	1.42 (1.09)	1.19 (1.06)	1.08 (0.96)	1.11 (0.93)	<i>F=2.56; NS</i>
Identified regulation	2.71 (0.84)	2.11 (0.78) <sup>A</sup>	2.14 (0.95) <sup>A</sup>	1.93 (0.79) <sup>A</sup>	<i>F=19.15; p&lt;.001</i>
Intrinsic motivation	2.93 (0.95)	2.45 (1.02) <sup>A</sup>	2.35 (1.13) <sup>A</sup>	1.85 (1.01) <sup>A<sup>B<sup>C</sup></sup></sup>	<i>F=21.01; p&lt;.001</i>

*Note:* <sup>A</sup> = significantly different from group A, <sup>B</sup> = significantly different from group B, <sup>C</sup> = significantly different from group C; NS=not significant, *p*>.05; *df*=degrees of freedom

**Table 4.10** Comparison of need satisfaction and motivation between exercise change groups at time 2

	<b>Group A</b> <i>Maintainers</i> (N=158) <i>Mean (SD)</i>	<b>Group B</b> <i>Drop-outs</i> (N=59) <i>Mean (SD)</i>	<b>Group C</b> <i>Take-ups</i> (N=61) <i>Mean (SD)</i>	<b>Group D</b> <i>Avoiders</i> (N=78) <i>Mean (SD)</i>	<b>ANOVA</b> <i>df=(3,352)</i>
Autonomy	5.23 (1.14)	4.59 (1.05) <sup>A</sup>	5.02 (1.26)	4.87 (1.12)	<i>F=4.959, p&lt;.005</i>
Competence	5.09 (1.03)	4.32 (1.10) <sup>A</sup>	4.65 (1.29)	3.97 (1.27) <sup>AC</sup>	<i>F=18.427, p&lt;.001</i>
Relatedness	5.08 (1.07)	4.42 (1.14) <sup>A</sup>	4.64 (1.33)	4.23 (1.33) <sup>A</sup>	<i>F=10.609, p&lt;.001</i>
Amotivation	0.34 (.68)	0.57 (.92)	0.34 (.60)	0.56 (.73)	<i>F=2.672, p&lt;.05</i>
External regulation	0.70 (.81)	0.78 (.85)	0.63 (.64)	0.82 (.79)	NS
Introjected regulation	1.44 (1.10)	0.90 (.85) <sup>A</sup>	1.24 (.96)	1.03 (.88) <sup>A</sup>	<i>F=5.488 p&lt;.001</i>
Identified regulation	2.69 (.84)	2.08 (.78) <sup>A</sup>	2.38 (.78)	2.01 (.84) <sup>C</sup>	<i>F=15.676, p&lt;.001</i>
Intrinsic motivation	2.96 (.86)	2.17 (1.07) <sup>A</sup>	2.62 (.96)	1.96 (1.12) <sup>AC</sup>	<i>F=21.698, p&lt;.001</i>

Note: <sup>A</sup> = significantly different from group A, <sup>B</sup> = significantly different from group B, <sup>C</sup> = significantly different from group C; NS=not significant,  $p>.05$ ; *df*=degrees of freedom

The results were consistent with the hypotheses for the outcome of LTE. A mismatch in need satisfaction and LTE at time 1 predicted change in both activity level and degree of self-determined motivation at time 2. Need satisfaction did not differ between *take-ups* and the *maintainers* at time 1, despite their different levels of engagement in LTE at baseline. By time 2 there was also no difference in motivation or behaviour, indicating these had improved to match the level of need satisfaction. Poor levels of need satisfaction at time 1 predicted poor levels of exercise at time 2, demonstrated by the similar levels of need satisfaction reported for *avoiders* and those whose activity levels later deteriorated (*drop-outs*). As predicted, despite equally positive activity levels at baseline, *drop-outs* experienced lower need satisfaction (reaching significance for competence and relatedness; moderate effect sizes,  $g = .63$  and  $g = .70$ ) than *maintainers*. Similarly, *take-ups* reported greater need satisfaction for exercise (significant only for competence, moderate effect size;  $g = .62$ ) than *avoiders*. Considering the three needs independently, the results indicated that dissatisfaction of the needs for competence and relatedness but not autonomy in an exercise setting were predictive of future drop-out for currently active adolescents. The adoption of exercise by those currently failing to reach Government recommended levels was predicted by satisfaction of the need for competence alone.

As anticipated in the hypotheses, time 1 motivation did not predict time 2 LTE, and motivational regulations more often *accompanied* change in behaviour, rather than preceded it. However, there was an unexpected finding for introjected regulation that is worthy of comment. Contrary to expectations in line with the theory of internalization (Deci et al., 1994), introjected regulation was associated with the uptake or maintenance of higher levels of activity over time, rather than with poorer activity levels (i.e., it was higher at time 2 in *maintainers* and *take-ups* than other groups). Thus although typically considered to be a controlling form of motivation that does not predict long term adherence, in the present sample higher levels of introjected regulation *were* associated with positive outcomes at one year. However, it should be noted that relative to the strength of identified and intrinsic motivation, introjected regulation remained a weaker form of regulation.

Hypothesis 3 was not supported for QoL. It was predicted that need satisfaction would differentiate between different levels of QoL at time 2, rather than at time 1 (i.e., it would predict future QoL, rather than QoL here and now). However, this was not the case. There was no anticipated difference at time 1 between the need satisfaction of adolescents who experienced persistently good QoL, and those for whom QoL deteriorated, however both groups differed from those with poor starting QoL. Similarly, need satisfaction did not discriminate between participants reporting poor QoL at baseline

(groups C and D, Table 4.11) who would maintain poor QoL or improve, both of which groups reported similarly low need satisfaction that was significantly different from those reporting consistently good QoL (group A). Therefore, while need satisfaction appeared to match QoL at a given time point, it was not predictive of future change.

There were few differences between the levels of each type of motivational regulation across the four QoL groups at time 1. The only consistent difference was that those who maintained good QoL reported significantly more autonomous motivation (i.e., identified and intrinsic regulation) and less controlled motivation (i.e., introjected and external regulation) than those with persistently poor QoL. At time 2 these differences remained, but significant differences also emerged between the group who experienced a deterioration in QoL, and those reporting persistently poor QoL; although QoL had deteriorated for this group, they still retained significantly lower levels of amotivation and external regulation (i.e., more adaptive levels of these regulations), and higher levels of intrinsic motivation than the group whose QoL did not change. The differences in motivation were consistent with levels of need satisfaction, in that motivation did not distinguish between those who experienced an improvement in QoL from any other group. Overall, while need satisfaction and self-determined motivation in an exercise context appeared to differentiate those with consistently poor QoL from those with consistently good QoL, the sensitivity of the relationship was not sufficient to predict which adolescents would be likely to experience a meaningful change in their QoL over the study period.

#### **Hypothesis 4: Mediation of the relationship between negative WR-PSPs and LTE and QoL by need satisfaction and self-determined motivation**

The cross-sectional analysis in part one of the present study reported a negative indirect effect of WR-PSPs (perceiving oneself to be overweight, experiencing body dissatisfaction, and SPA) and extrinsic goal content on LTE participation and QoL examined at a single point in time. The aim of the present longitudinal analysis was to examine the persistence of these relationships over time in order to assess their longer term implications.

##### *Mediation Analysis for WR-PSPs*

Table 4.13 shows the bivariate correlations between the independent (time 1 WR-PSPs), dependent (time 2 LTE) and potential mediating variables (time 1 need satisfaction and motivational regulations) in the analysis. These were examined using Baron and Kenny's (1986) procedure of four causal steps to test for a mediating relationship. Two analyses

**Table 4.11 Comparison of need satisfaction and motivational regulation at time 1 by QoL change group**

	<i>Group A</i>	<i>Group B</i>	<i>Group C</i>	<i>Group D</i>	<i>ANOVA</i>
	Good QoL both time points	Deteriorating QoL	Improving QoL	Poor QoL both time points	<i>df</i> =3, 352
Autonomy	5.12 (1.14)	4.78 (1.09)	4.21 (1.46) <sup>A</sup>	3.98 (1.39) <sup>AB</sup>	<i>F</i> =17.14, <.001
Competence	4.91 (1.23)	4.68 (1.04)	3.67 (1.48) <sup>AB</sup>	3.80 (1.43) <sup>AB</sup>	<i>F</i> =19.48, <i>p</i> <.001
Relatedness	5.08 (1.09)	4.74 (1.16)	4.34 (1.41) <sup>A</sup>	4.15 (1.35) <sup>A-</sup>	<i>F</i> =12.36, <i>p</i> <.001
Amotivation	.27 (.58)	.45 (.76)	.51 (.78)	.72 (.93) <sup>A</sup>	<i>F</i> =7.35, <i>p</i> <.001
External motivation	.64 (.69)	.75 (.75)	.72 (.65)	.99 (1.00) <sup>A</sup>	<i>F</i> =3.44, <i>p</i> <.05
Introjected motivation	1.30 (1.04)	1.02 (.95)	1.37 (.98)	1.17 (1.11)	<i>F</i> =1.04, NS
Identified motivation	2.49 (.89)	2.26 (.77)	2.21 (.90)	1.98 (.89) <sup>A</sup>	<i>F</i> =6.04, <i>p</i> <.01
Intrinsic motivation	2.75 (.98)	2.46 (1.07)	2.10 (1.21) <sup>A</sup>	1.99 (1.13) <sup>A</sup>	<i>F</i> =11.25, <i>p</i> <.001

Note: <sup>A</sup> = significantly different from group A, <sup>B</sup> = significantly different from group B; NS= non significant, *p*>.05; all effect sizes ≥ moderate, (i.e., Hedges *g*≥.5) except for those marked “-”, for which the effect size was negligible (i.e., Hedges *g*<.2); *df*=degrees of freedom

**Table 4.12 Comparison of need satisfaction and motivational regulation at time 2 by QoL change group**

	<b>Group A</b> Good QoL both time points	<b>Group B</b> Deteriorating QoL	<b>Group C</b> Improving QoL	<b>Group D</b> Poor QoL both time points	<b>ANOVA</b> <i>df</i> =3,352
Autonomy	5.29 (1.02)	4.77 (1.00) <sup>A</sup>	5.00 (1.03)	4.19 (1.36) <sup>AC</sup>	$F=17.47, p<.001$
Competence	4.93 (1.10)	4.64 (1.02)	4.20 (1.32) <sup>A</sup>	3.93 (1.34) <sup>AB</sup>	$F=14.33, p<.001$
Relatedness	5.01 (1.12)	4.54 (1.13)	4.75 (.91)	3.78 (1.39) <sup>ABC</sup>	$F=19.07, p<.001$
Amotivation	.29 (.59)	.40 (.54)	.53 (.76)	.86 (1.00) <sup>AB</sup>	$F=11.51, p<.001$
External motivation	.60 (.73)	.44 (.55)	.84 (.67)	1.24 (.92) <sup>AB</sup>	$F=13.93, p<.05$
Introjected motivation	1.23 (1.02)	1.02 (.88)	1.17 (.98)	1.37 (1.09)	$F=.97, NS$
Identified motivation	2.53 (.87)	2.14 (.77)	2.22 (.80)	2.14 (.87) <sup>A</sup>	$F=5.41, p<.01$
Intrinsic motivation	2.81 (.97)	2.08 (1.09)	2.45 (1.01)	1.99 (1.08) <sup>AB-</sup>	$F=14.11, p<.001$

Note: <sup>A</sup> = significantly different from group A, <sup>B</sup> = significantly different from group B; NS= non significant,  $p>.05$ ; all effect sizes  $\geq$  moderate, (i.e., Hedges  $g \geq .5$ ) except for those marked “-”, for which the effect size was negligible (i.e., Hedges  $g < .2$ ); *df*=degrees of freedom

**Table 4.13 Bivariate correlations between all variables in the mediation analysis**

	Body Satisfaction (N=345)	SPA (N=356)	Autonomy	Competence	Relatedness	Amotivation	External Regulation	Identified Regulation	Intrinsic Motivation
Exercise T2	.195***	-.124*	.209***	.274***	.200***	-.140**	-.113*	.263***	.246***
Body Satisfaction	-		.335***	.532***	.283***	-.190***	-.155**	.280***	.341***
SPA		-	-.210***	-.365***	-.156***	.183***	.206***	-.110*	-.215***

Note: \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

**Table 4.14a Estimates, and confidence intervals of the indirect effects of WR-PSP on exercise, mediated by need satisfaction**

	Autonomy	Competence	Relatedness	Total Effect Of Need Satisfaction
Body satisfaction	.73 (-.80 to 2.28)	5.46 (1.49 to 9.13)	1.00 (-.32 to 2.56)	7.20 (4.41 to 10.81)
SPA	-.57 (-1.87 to 36)	-4.39 (-7.71 to 2.03)	-.64 (-1.69 to .11)	-5.60 (-8.48 to -3.63)

**Table 4.14b Estimates, and confidence intervals of the indirect effect of WR-PSPs on exercise, mediated by motivation**

	Amotivation	External Regulation	Introjected Motivation	Identified Regulation	Intrinsic Motivation	Total Effect Of Motivation
Body Satisfaction	-.66 (-1.82 To .03)	.73 (.13 To 1.81)	-.20 (-1.35 To 1.49)	4.96 (2.57 To 8.07)	.96 (-1.04 To 3.63)	5.79 (3.54 To 9.07)
SPA	.66 (.11 to 1.84)	-1.03 (-2.41 to -.22)	-.88 (-2.47 to -.10)	-2.06 (-4.58 to -.58)	-.88 (-2.74 to .58)	-4.19 (-7.42 to -2.22)

were conducted; (i) to test the mediating effect of the three measures of need satisfaction on the relationship between WR-PSPs and LTE, and (ii) to test the mediating effect on QoL.

Of the WR-PSPs considered (body satisfaction, SPA, perceived weight status, perceived pressure to lose weight), only body satisfaction (positively) and SPA (negatively) were significantly correlated with LTE at time 2 ( $r=.20$ , and  $r=-.12$  respectively). Therefore, only these two factors were included in the further mediation analysis. Body satisfaction (positively) and SPA (negatively) were significantly correlated to all need satisfaction and motivational regulation variables, with the exception of introjected regulation. In order to calculate an estimate of the indirect effect of the independent variables, regression equations were constructed to predict dependent variables from the independent variables, while controlling for mediating variables. The regression coefficient between body satisfaction and LTE decreased from  $R^2=.20$ , to  $R^2=.06$  (NS) when controlling for need satisfaction variables, and to  $R^2=.09$  (NS) when controlling for motivational regulations. The regression coefficient between SPA and exercise decreased from  $R^2=-.34$  to  $R^2=-.03$  (NS) when controlling for need satisfaction variables, and to  $R^2=-.05$  (NS) when controlling for motivational regulations. As the regression coefficients of indirect effects were no longer significantly different from zero, these findings indicate full mediation of the relationship. As all four causal steps of the mediation analysis were met, the results suggest that the relationship between WR-PSPs and LTE over time was fully mediated by both need satisfaction and motivation as predicted by the initial hypothesis.

A hierarchical regression analysis was conducted to assess the comparative strength of all mediating variables in a single model. In predicting the dependent variable of time 2 LTE, time 1 LTE was entered in the first step of the model, followed by need satisfaction variables as the second step, motivational regulations as the third step, and finally, (a) body satisfaction or (b) SPA. The models were significant for both physical self-perceptions; (a)  $R^2=.17$ ,  $F(9,335)=7.46$ ,  $p<.001$ , and (b)  $R^2=.16$ ,  $F(9,346)=7.57$ ,  $p<.001$ . For body satisfaction, the significant positive predictors in the model were time 1 exercise level ( $\beta=.25$ ,  $p<.001$ ) and identified regulation ( $\beta=.17$ ,  $p<.05$ ); external regulation was a negative predictor ( $\beta=-.13$ ,  $p<.05$ ). For SPA, time 2 exercise level was positively predicted by time 1 exercise ( $\beta=.25$ ,  $p<.001$ ), identified regulation ( $\beta=.18$ ,  $p<.05$ ) and negatively by external regulation ( $\beta=-.13$ ,  $p<.05$ ; Table 14). Neither body satisfaction nor SPA predicted any additional unexplained variance in time 2 LTE beyond that explained by motivation. Thus, both models supported the primacy of motivational regulations in mediating the relationship between physical self-perceptions and LTE above that of need satisfaction.



Following the same procedures as outlined for LTE, a significant mediating relationship was also found for the relationship between WR-PSPs and QoL (Tables 4.15 and 4.16). The regression coefficient between body satisfaction and QoL decreased from  $R^2=.29$ , to  $R^2=.17$  when controlling for need satisfaction variables, and to  $R^2=.22$  when controlling for motivational regulations. The correlation coefficient between SPA and QoL decreased from  $R^2=-.34$  to  $R^2=-.28$  when controlling for need satisfaction variables, and to  $R^2=-.29$  when controlling for motivational regulations. Although somewhat reduced, these correlations were all still statistically significant ( $p<.01$ ), suggesting that the relationships were only partially mediated by need satisfaction and motivation.

For both independent variables, the bootstrap confidence intervals (Table 4.16) indicated that the effect of WR-PSPs was significantly mediated by the individual need for autonomy, but not for competence or relatedness. For the mediation analysis of motivational regulations, there was again a significant total effect for the combined motivational regulations for both SPA and body satisfaction, but in each case the only individually significant mediator was external regulation. Thus, body satisfaction and SPA have an impact on time 2 QoL through either enhancing (in the case of body satisfaction), or compromising (in the case of SPA) the need for autonomy, and by reducing (in the case of body satisfaction) or increasing (in the case of SPA) the likelihood of engaging in exercise as a result of external regulations.

The hierarchical regression analysis reported that the relationship between body satisfaction and QoL was significantly predicted only by time 1 QoL ( $\beta=.58$ ,  $p<.001$ ), indicating a weak effect for the mediating variables ( $R^2=.37$ ,  $F(9,331)=21.56$ ,  $p<.001$ ). The relationship between SPA and QoL was predicted by time 1 QoL ( $\beta=.55$ ,  $p<.001$ ), and also by SPA ( $\beta=-.14$ ,  $p<.01$ ; for the full model  $R^2=.37$ ,  $F(9,341)=22.07$ ,  $p<.001$ ). As no need satisfaction or motivational regulation predicted additional variation in the outcome, the findings indicated that need satisfaction and motivation only partially mediated the relationship between SPA and QoL. This finding is in agreement with the results of Part 1, which reported a direct path from SPA to QoL in the final SEM model.

#### *Mediation Analysis for Exercise Goal Content*

Hypothesis 4 for extrinsic goal content was not supported, as there was no association between extrinsic goal content at time 1 with either LTE ( $r=.01$ ) or QoL ( $r=-.06$ ) at time 2. As such, the first requirement for establishing a mediating relationship was not met (i.e., no significant correlation between independent and dependent variables; Baron & Kenny, 1986). Intrinsic goal content had a small but significant relationship with LTE at time 2

**Table 4.15** Bivariate correlations between independent, mediating, and dependent variables in the mediation analysis

	<i>Body Satisfaction</i>	<i>SPA</i>	<i>Autonomy</i>	<i>Competence</i>	<i>Relatedness</i>	<i>Amotivation</i>	<i>External Regulation</i>	<i>Identified Regulation</i>	<i>Intrinsic Motivation</i>
<i>QoL T2</i>	.29***	-.34*	.28***	.26***	.19***	-.20**	-.15**	.17**	.23***
<i>Body Satisfaction (N=345)</i>	-		.34***	.53***	.28***	-.19***	-.16**	.28***	.34***
<i>SPA (N=356)</i>		-	-.21***	-.37***	-.16***	.18***	.21***	-.11*	-.22***

Note: \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

**Table 4.16a** Confidence intervals of indirect effects of need satisfaction

	<i>Autonomy</i>	<i>Competence</i>	<i>Relatedness</i>	<i>Total Effect Of Need Satisfaction</i>
<i>Body Satisfaction</i>	.40 (.16 to .72)	.18 (-.31 to .57)	.07 (-.10 to .29)	.65 (.22 to 1.01)
<i>SPA</i>	-.28 (-.56 to -.11)	-.03 (-.36 to .27)	-.06 (-.21 to .05)	-.38 (-.71 to -.10)

**Table 4.16b** Confidence intervals of indirect effects of motivational regulations

	<i>Amotivation</i>	<i>External Regulation</i>	<i>Introjected Motivation</i>	<i>Identified Regulation</i>	<i>Intrinsic Motivation</i>	<i>Total Effect Of Motivation</i>
<i>Body Satisfaction</i>	-.02 (-.03 to .26)	.09 (.03 to .31)	.01 (-.04 to .12)	-.12 (-.36 to .16)	.28 (-.04 to .61)	.38 (.12 to .71)
<i>SPA</i>	-.08 (-.25 to -.04)	-.16 (-.39 to -.04)	.07 (-.001 to .24)	-.01 (-.16 to .10)	-.13 (-.40 to .07)	-.31 (-.60 to -.08)

when controlling for LTE at time 1 ( $r = .12, p < .05$ ), and there was a small but significant negative correlation between intrinsic goals and change in QoL ( $r = -.13, p < .05$ ).

Extrinsic goals were significantly related to time 2 external, introjected and identified regulations (i.e., all forms of extrinsic regulation; Table 4.17). All of these relationships were mediated by time 1 need satisfaction (all three needs entered concurrently). Therefore, the findings suggest that the impact that extrinsic goal content has on behavioral and psychosocial outcomes is through contributing to a social exercise environment that compromises need satisfaction. The results for intrinsic goal content are shown for completeness; however these were outside the main study hypotheses.

**Table 4.17 Correlations between goal content scores at time 1, and motivation at time 2**

	Change in LTE	Motivational regulation				
		Amotivation	External	Introjected	Identified	Intrinsic
Intrinsic goals	-.06	-.13*	.05	.29***	.42***	.41***
Extrinsic goals	-.03	.06	.21***	.28***	.16**	.09
<b>Partial correlations (controlling for baseline motivation)</b>						
Intrinsic goals		.06	.18**	.25***	.25***	.19***
Extrinsic goals		.09	.23***	.27***	.12*	.04

## 4.4 Discussion

The primary purpose of the present study was to assess the relationships between negative WR-PSPs, LTE and QoL, mediated through exercise goal content, need satisfaction, and motivation. Part 1 assessed the relationships at a cross-sectional level, by testing the fit of the data to a hypothesised model of associations through SEM. Following some minor modifications the hypothesized model was supported (Figure 4.2). A second aim was to test the model for measurement invariance across gender. The results revealed the model to be partially invariant, with one path differing between groups: the path between BMI and perceived pressure to lose weight was significant for boys but not for girls. This finding is in line with inferences from previous work which has shown that it is perceptions of whether or not one is overweight, and not BMI, that predicts perceived pressure to be slim in adolescent girls (Brenner et al., 2004; Crocker et al., 2003). All other paths included in the hypothesised model were significant across gender, supporting the hypothesis that the model fit was largely invariant.

Perceptions of pressure to lose weight were an important antecedent to perceptions of SPA and the endorsement of extrinsic goals. This pathway makes conceptual sense, as it could be expected that individuals who perceive external pressures to lose weight experience increased evaluative threat, which manifests as SPA in social settings (Raedeke et al., in press). The direct path from perceived pressure to lose weight to extrinsic exercise goals can be interpreted in light of SDT; individuals who perceive that they have been pressurised and/or coerced into action by others (e.g., parents, peers) would be expected to pursue goals focusing on external indicators (e.g., image, interpersonal comparison, etc., Deci & Ryan, 2002; Vansteenkiste et al., 2004a).

In addition to an association between perceived pressure to lose weight and SPA, there was a direct relationship between SPA and extrinsic goal content. The direction of the effect is consistent with that found in previous work grounded in SDT, which suggests a link through need satisfaction. Vansteenkiste, Soenens, and Lens (2007) suggest that interpersonal comparisons will in general undermine basic need satisfaction (i.e., for autonomy, competence, and relatedness; cf. Deci et al., 2001) which underpin both motivation and behavioural goals, and will leave people with a sense of insecurity and intra-individual threat. This series of consequences may also explain the additional direct path from SPA to QoL indicated by the data. SPA indicates the presence of negative self-perceptions which would thus be expected to have a direct impact on the QoL domain of the same name, in addition to others such as social relationships, and perceptions of bullying/teasing. The lack of a significant negative path between SPA and intrinsic goals was contrary to the hypothesis. However, this null finding could suggest that when individuals endorse an internal focus towards exercise they do not engage in negative interpersonal comparisons, and as such avoid the experience of anxiety related to how others may evaluate their physique in social settings.

The lack of a direct path between exercise goal content and either BMI or perceiving oneself to be overweight was a key finding in the understanding of the development of extrinsic goals. It suggests that extrinsic exercise goals are not an inevitable outcome of either being overweight, or perceiving oneself to be so, and that instead it is perceptions of pressure to lose weight coming from external sources that is of greater importance. Such a finding is congruent with SDT which suggests that extrinsic goals characterised by “outward” and “having” orientations are usually formed in response to external pressures (Deci & Ryan, 2000; Vansteenkiste et al., 2006). Individuals endorsing extrinsic goals rarely experience activities as satisfying due to their focus on external indicators (e.g., self-worth and interpersonal comparisons) that undermine the promotion of relationships

and distract from a natural growth orientation (Furnham & Calnan, 1998; Vansteenkiste et al., 2004a).

While the endorsement of intrinsic and extrinsic goals differentially predicted self-determined motivation, significant indirect effects showed a theoretically coherent pattern of associations among the goals and outcome variables. The effects of goal content on the dependent variables were partially mediated by self-determined motivation. In showing the goal content dimensions to explain independent variance in the dependent variables, the findings are consistent with both the theoretical tenets of SDT (Deci et al., 2001) and recent empirical research in school (Vansteenkiste et al., 2005a) and adult exercise settings (Vansteenkiste et al., 2004b). Collectively, the present findings support past work (cf. Vansteenkiste et al., 2007) in suggesting that fostering intrinsic goals could be beneficial for improving the mental health and exercise behaviour in adolescents, and reinforces the need to understand both the *what* and *why* of motivation.

The second part of the study aimed to assess the tenability of these relationships over time (one year). The individual pathways of the time 1 model were deconstructed to allow a more detailed analysis of the associations between constructs, and were tested against four study hypotheses. The first two hypotheses tested the basic assumptions of the relationships on which the later analyses rested. The first of these was to establish whether the deterioration of LTE (e.g., Caspersen et al., 2000) and QoL (e.g., Ravens-Sieberer et al., 2005) reported in previous research was observed in the present sample. Contrary to predictions, there was no statistically significant deterioration found in mean scores of either outcome. However, this masked considerable variation for a proportion of adolescents at an individual level. For example, 37% of adolescent girls who were active according to Government recommendations at baseline became inactive by time 2, while 33% increased their LTE from insufficient to healthy levels over the year. This finding indicates that a decrease in exercise levels in girls need not be inevitable, and increasing involvement in sport and exercise during adolescence is a realistic and achievable aim.

The lack of deterioration in exercise levels was a surprising finding given that it is so widely reported in other research (e.g., Caspersen et al., 2000; Sallis, 2000) and cited in National policy documents (DoH, 2004a). It may be that this was an effect of studying a relatively restricted age range (14-15) which may not have recorded exercise at the steepest level of decline (which is predicted to occur from the age of 12 in girls, and 15 in boys; Thompson et al., 2003). Alternatively, the decline in physical activity reported at this age, may not result from decreases in engagement in sport and exercise as recorded by the LTEQ, but may instead be due to declines in other forms of physical activity (e.g., walking for transport) or increases in sedentary behaviour which were not recorded.

Measurement of exercise at a greater number of time points, and in a wider age range of participants would be necessary to explore this further, for example by tracking exercise levels from late childhood (i.e., from age 11) to school leaving age, and taking measurements at yearly intervals. Similarly, it may be that the self-report measure used was not sensitive to change. The use of an objective measure of exercise, such as accelerometers or pedometers would also have provided a more accurate estimate of exercise at each time point (addressed further in the limitations section).

The lack of decline in QoL over time was also contrary to predictions based on previous research reports (e.g., Bisegger et al., 2005; Brossart et al., 2002; Drukker et al., 2006). This will be addressed more fully in chapter 5, which explores the phenomenon of response shift in QoL measurement which may influence the comparability of QoL measures at any two time points.

The second longitudinal hypothesis examined the relationship between need satisfaction and motivation; the psychosocial constructs proposed by SDT to be central of the translation of environmental characteristics into individual outcomes (Deci & Ryan, 1985a; Ryan & Deci, 2002). According to basic needs theory, the satisfaction of the needs of autonomy, relatedness and competence is a prerequisite for the development and maintenance of self-determined forms of motivation (Deci & Vansteenkiste, 2004; Ryan & Deci, 2002). A longitudinal relationship was confirmed between need satisfaction and self-determined motivation for both identified and intrinsic regulations, thus corroborating the importance of need satisfaction in both sustaining intrinsic motivation, and facilitating more self-determined forms of extrinsic motivation in an exercise context. Poor levels of need satisfaction would also be expected to increase external and introjected regulation and amotivation (Ryan & Deci, 2002). This effect was not reported by the present sample. Such a finding suggests that either the negative effects of poor need satisfaction are more transient than the positive effects of good satisfaction, or that support for need satisfaction was at a sufficiently high level at baseline that no negative effect resulted.

#### ***4.4.1 Longitudinal Relationships and their Implications for the Process of Internalization***

Having established an adequate longitudinal association between need satisfaction and motivation, the third hypothesis explored whether need satisfaction was also predictive of longitudinal behavioural (LTE) and psychological (QoL) outcomes. Through examining the individual effects of each of the three needs on naturally occurring change in LTE, the present findings suggest that not all needs are equally important for either the support of existing LTE, or encouragement of its adoption. The results suggest that promoting perceived competence may be of the greatest value in encouraging inactive adolescents

to adopt exercise, whereas for those already active, behaviour may be better maintained through the satisfaction of the needs for competence and relatedness. Thus, for LTE, the findings from Hypothesis 3 provide an indication of which aspects of the exercise environment it may be important to focus on in order to achieve the uptake versus maintenance of behaviour for use in applied research. Autonomy did not significantly predict change in LTE in either direction, however, it did differ significantly between *maintainers*, and *avoiders*. This suggests that satisfaction of autonomy is a necessary but not sufficient attribute to facilitate engagement in LTE, and as such is in line with Deci and Ryan's assertion that all three needs are necessary for optimal functioning (2001).

The changes in LTE were reflected by changes in motivation in the directions predicted by SDT. As need satisfaction is considered to be an antecedent to motivation, the finding that it was baseline need satisfaction that predicted behavioural change and not baseline motivation, is consistent with SDT (Ryan & Deci, 2002). It is also consistent with previous research findings. For example in a sport setting Sarrazin et al. (2002) tracked the involvement of female adolescent handball players (age 13-15) over a period of 21 months, relating their participation at the end of the study to baseline perceptions of their coaching environment. Consistent with the present study, the authors found that drop-out was significantly predicted by poorer reported need satisfaction at baseline, but not by levels of extrinsic forms of regulation (external, introjected or identified). Sarrazin and colleagues also acknowledged that the effects of baseline need satisfaction may be mediated through the level of self-determined motivation. In the present study this was demonstrated by need satisfaction at time 1 leading to behaviour change over time that was consistent with expected changes in self-determined motivation.

Additional insights into processes of behavioural change are provided by looking at the role of the different individual motivational regulations. While differences in intrinsic motivation at time 1 differentiated between groups (it was significantly greater in those currently involved in LTE and likely to continue (*maintainers*), than those not involved in LTE and not likely to change (*avoiders*)), there was very little change in intrinsic motivation among those whose LTE increased or decreased. This is perhaps to be expected as intrinsic motivation is considered to be related to inherent interest in activities, and as such cannot be "created" in the way that identified regulation can be facilitated through internalization (Deci & Ryan, 1975). Thus, increases in exercise were not brought about through adolescents discovering inherent pleasure in new activities, and neither was dropping out of exercise brought about by compromise of intrinsic motivation; the *drop-outs* were lower in intrinsic motivation than *maintainers* even when they were active at time 1. This finding leads to the suggestion consistent with previous work aligned with SDT that the changes in behaviour were likely to be brought about through facilitating or

hindering the internalization of extrinsic forms of motivation (e.g., Pelletier et al., 2001; Thøgersen-Ntoumani & Ntoumanis, 2006; Edmunds et al., in press-b). It is also reflective of the assumption that although intrinsic motivation represents the pinnacle of fully self-determined motivation, given the conflicting demands on a person's time, intrinsic motivation alone (i.e., seeking pleasure and enjoyment) is not sufficient to prioritise this activity above others (Mullan & Markland, 1997). That is, a behaviour must be considered important, in addition to providing a positive experience for it to persist on a regular basis.

Of the three forms of extrinsic motivation, differences between LTE change groups were seen only in introjected and identified regulations. There was no difference in the degree of external regulation between any group at any time point, which is perhaps expected as the outcome measure was exercise during leisure-time, and thus engagement in optional forms of physical activity, rather than mandatory exercise such as school PE. In the present study, an increase in identified regulation was predicted to accompany the uptake of LTE, as would be expected through internalization (Deci et al., 1994). This finding is consistent with past work in health (Williams et al., 2004), education (Pelletier et al., 2001) and exercise contexts (e.g., Thøgersen-Ntoumani & Ntoumanis, 2006; Edmunds et al., in press-b) reporting that identified regulation is the most important regulation in predicting adaptive behaviour.

Introjected regulation can be experienced either as a positive motivator associated with the early stages of the adaptive process of internalization, or as a controlling form of regulation when associated with established behaviours (Deci et al., 1994). There was no difference in reported introjected regulation in the present study between any LTE group at time 1, but by time 2 while introjected regulation remained constant for *maintainers*, and even increased for *take-ups*, it decreased and was significantly lower in both *drop-outs* and *avoiders*. This presents two interesting points; (i) that persistent levels of introjected regulation appear to be adaptive to the maintenance of LTE, and (ii) that a decrease in introjected regulation appeared to inhibit sustained involvement in LTE. In accordance with SDT, a reduction in introjected regulation was expected in *maintainers* and *take-ups* to reflect their greater internalization of the behaviour and a move to be motivated through greater identified regulation (Deci et al., 1994). No such changes were found. Such a finding may reflect the fact that internalization takes more than a year to occur, as is consistent with previous work reporting a significant predictive effect of introjected regulations on exercise participation in swimmers up to 10 months, but not after 22 months (Pelletier et al., 2001).

Despite its unexpected relation to change in LTE, introjected regulation was lower than identified and intrinsic regulation within active individuals at both time points indicating that



it was present perhaps as a supplementary rather than primary source of motivation. Thus, rather than having a large positive impact on behaviour, the findings for active individuals suggest that a degree of introjected regulation appears not to be problematic in the support of behaviour that is otherwise largely self-determined. This is supported by the finding that at the levels reported, introjected regulation was not indicative of poorer QoL (see tables 4.11 and 4.12). However, the findings for the effects on low-level exercisers extend this to suggest that there is a clear advantage to retaining a certain level of introjected regulation, as its deterioration below this is associated with decreased LTE. This is demonstrated as a decline in introjected regulation that was observed in the *drop-out* group (from  $M=1.19$ ,  $SD=1.06$  to  $M=.90$ ,  $SD=.85$ ,  $g=.30$ ) was accompanied by a decrease in exercise levels, while a small increase in introjected regulation was related to increases in exercise participation in the *take-up* group ( $M=1.08$   $SD=.96$  to  $M=1.24$   $SD=.96$ ,  $g=.17$ ). As such, the role of introjected regulation of exercise maintenance, in addition to its role in the uptake of behaviour as the first step of internalization warrants further study. Future work could examine whether there is a certain threshold which is essential to maintenance, or whether a decrease in introjected regulation may mark the conscious cessation of attempts to internalize externally valued behaviours, indicating that the individual is no longer interested in trying to adopt the activity.

Need satisfaction and motivational regulations were less strongly predictive of QoL over time. Such a finding is in part to be expected, as exercise and physical activity is only one small area of the many domains which contribute to a person's global assessment of their QoL. While improvements in one life domain are likely to have an impact on QoL as a whole, the effect will not be as large at a global level as it will be within that specific domain. Justification for this reasoning is provided by Vallerand's (1997) Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM). According to this theory, need satisfaction and motivation at a particular level of generality (situational, contextual or global) can influence motivation or outcomes at adjacent levels, but these influences will not be as strong as the relationships between effects at the same level of generality. In the present study, need satisfaction and motivation were measured at the contextual level (i.e., exercise), and would therefore be expected to have a lesser association with changes in QoL measured at a global level, than they would with LTE, which lies within the same context.

#### **4.4.2 The Long-Term Effect of Weight-Related Physical Self-Perceptions**

The fourth and final hypothesis explored whether WR-PSPs and extrinsic goal content had indirect effects on LTE and QoL over time, mediated through need satisfaction and self-determined motivation. Mediation analysis confirmed the predicted indirect effects of body satisfaction and SPA on LTE, mediated through both need satisfaction and

motivation. Specifically, the effect of body satisfaction on LTE was mediated through enhancing perceptions of competence, promoting identified regulation and reducing external regulation. SPA had a negative effect on LTE through promoting external regulation, and inhibiting identified motivation. These two findings are consistent with previous work relating physical self-perceptions to both motivation and physical activity (e.g., Frederick & Morrison, 1996; Neumark-Sztainer et al., 2006). For example, longitudinal associations have been reported between body satisfaction and physical activity over a five year period with a sample of 2516 adolescents (Neumark-Sztainer et al., 2006), and cross-sectionally, physical self-perceptions have been associated with lower levels of physical activity in 14 year olds (Crocker et al., 2003). SPA is reported to be associated with controlling forms of motivation in young adults (Frederick & Morrison, 1996). Consistent with theory and past research (Ntoumanis, 2005; Standage et al., 2006), motivational regulations were more strongly predictive of outcomes than need satisfaction, confirming the suggestion that the effects of need satisfaction are at least partially mediated by motivation. In the present sample, the strongest mediators in the model were identified and external regulation. Combining these findings with those of Hypothesis 3, the results suggest that while current need satisfaction is predictive of future change (or stability) in LTE, the process is facilitated through change in motivation.

WR-PSPs were also predictive of QoL mediated through need satisfaction and motivation over the long term, although the degree of mediation was weaker. SPA retained an independent direct effect on QoL which persisted after the mediating variables had been accounted for. This finding is not unexpected, as a strong direct negative path was found for the impact of SPA on QoL in the cross-sectional associations reported in part one of this study. It is also consistent with past work which reports negative associations between SPA and indices of poor well-being such as negative physical self-attributions (Crocker et al., 2003) and substance abuse (Sabiston et al., 2007). The results of this analysis extend support for the relationship between WR-PSPs identified in part one at a cross-sectional level to demonstrate persistence over a one year period, highlighting the importance of attending to factors within an exercise environment which may influence perceptions of SPA and body satisfaction.

No such strong associations were found for the effects of extrinsic goals on LTE or QoL over time. This suggests that the negative effect of extrinsic exercise goal content reported in part one of the study was a result of their more proximal influence on need satisfaction and motivation, as suggested by SDT (Deci et al., 2000).

#### **4.4.3            *Limitations***

The first limitation of the present study is the use of a self-report exercise measure, a method that can result in overestimates of activity levels (Epstein et al., 1996; Sallis & Saelens, 2000). While attempts were made to ensure that a measure that had been validated with adolescents was used (Sallis & Saelens, 2000), it is acknowledged that the use of an objective measure, either in addition to, or in support of self-reports would strengthen the findings (Shephard, 2003). LTE could have been more accurately measured using objective measures such as pedometers and accelerometers (Sarkin et al., 2000). Such options were not used in the present study, firstly as the number required were not available within given resources, and secondly, as although they are more accurate than self-reports, the majority of affordable instruments only provide a measure of total physical activity. They do not provide a breakdown of whether physical activity is taken during leisure-time (the variable of interest in the present study) or through the activities of daily living, or mandatory school PE. If purposeful exercise cannot be isolated from other types of physical activity through objective instruments, there would be no increase in the accuracy of the estimates of the relationships studied in this chapter, regardless of the accuracy of the measurement tool. Therefore, although subject to a certain degree of error, the self-report method used to collect exercise data in this research was considered to be a justifiable and appropriate choice.

A second limitation of the present study was that only two time points were used. Extending the study to measure outcomes on three or more occasions would have provided information on the pattern of change, and greater confidence that the findings reflect real change rather than more transitory fluctuations.

#### **4.4.4            *Practical Implications and Future Directions***

SDT is a useful theory for applied research in this context as it not only provides clear information regarding the aspects of a social environment which may be important in determining need satisfaction, and thus which promote self-determined motivation, but also provides examples of how the environment can be manipulated in order to achieve this.

The first (cross-sectional) part of the present study indicated a role for extrinsic exercise goal content in compromising levels of LTE and QoL as an outcome of negative WR-PSPs. While at a cross-sectional level extrinsic goals for exercise (such as exercising for weight control and improving appearance) appeared maladaptive, there was no association with either outcome one year later. Instead, a more persistent relationship was found between WR-PSPs and LTE and QoL regardless of effects on goals for exercise. This finding demonstrates the need to take a longer-term view of associations

detected at a single point in time, in order to avoid focusing on characteristics of an environment which turn out not to be causally important. The findings of the present longitudinal analyses suggest that efforts may be better diverted towards targeting WR-PSPs in promoting exercise persistence in adolescents than in changing their goal content orientations. The effect of WR-PSPs was mediated through both need satisfaction and motivational regulation, most strongly through the extrinsic motivation types of identified and external regulation. Thus, the findings from Hypothesis 4 suggest that specifically targeting the promotion of body satisfaction (or reduction of dissatisfaction), and the reduction of SPA in adolescent exercise settings, or reducing their salience through manipulating the class environment may be useful means to promote need satisfaction and self-determined motivation.

A number of studies tackling body related cognitions have been reported from other theoretical or atheoretical perspectives. These include approaches such as providing greater flexibility regarding what sports kit must be worn (Jamner et al., 2004), delivering PE in single sex classes (Neumark-Sztainer et al., 2003b; Pate et al., 2005), and ensuring a health- as opposed to image-oriented leadership style (Raedeke et al., in press). For example, Raedeke et al (in press) found that SPA could be reduced and better affective outcomes achieved in exercise classes run by an instructor in loose rather than tight-fitting clothing, and which were run in areas without wall mirrors. Such findings are useful for providing feedback to teachers, parents, and health professionals of the potential negative implications of WR-PSPs for exercise and well-being, and providing simple measures that could be used to attempt to address them. Within the present study, WR-PSPs were shown to have a stronger effect on QoL than they did on LTE. This is particularly the case for SPA which retained a direct negative pathway to QoL after potential mediating variables had been controlled for. These results may partially be explained as such self-perceptions are attributes which are relevant across contexts and life domains, rather than restricted to the exercise context alone. Therefore, it would be useful to explore whether programmes which have a beneficial effect on WR-PSPs can have additional benefits on other adolescent life domains.

The lack of a deleterious effect of extrinsic goals for exercise over the long-term is an interesting finding in itself for future research. Most new behaviours originate from extrinsic regulations as they are adopted in response to prompts or suggestions from others (Deci et al., 1994). A key constituent of environments that promote the adoption of externally motivated behaviour is reported to be the presence of a meaningful rationale suggesting why a person should want to take up the new activity (Deci et al., 1994; Sheldon et al., 2004). As such, learning new activities is often goal driven, be the goals social (i.e., to gain praise/avoid punishment) or more outcome focussed (e.g., for

health/weight control, or skill development). One of the premises for the present thesis is that exercise may decline in adolescence as it does not fit in with the life-goals of adolescents. Physical appearance and associated weight gain are reportedly key concerns for adolescents (Craft et al., 2003), and as such may well represent highly meaningful reasons for taking part. However, as they represent extrinsic goals, SDT suggests they would be ultimately maladaptive as motivators for exercise in the long term (Deci et al., 1994). The present findings suggest that while there is some negative association in the short term, the expected negative long term relationship was not found. Instead, the findings suggest that extrinsic goals are a symptom of negative WR-PSPs which are themselves the stronger predictor of negative long-term outcomes. Future work would be useful to explore why the present findings from a naturalistic setting (i.e., in which both intrinsic and extrinsic goals pre-exist for a familiar behaviour) contrast with previous experimental research reporting negative effects of extrinsic goals in the uptake of new activities (e.g., Sheldon et al., 2004; Vansteenkiste et al., 2005a).

A second finding from the present study with implications for practice was a confirmation of the mediating role of need satisfaction in promoting self-determined motivation and subsequent positive LTE and QoL outcomes. In hypothesis 3, it was found that although all three needs were important for the uptake and maintenance of LTE, they did not all have independent predictive effects. Competence was found to be important both for supporting active students to maintain their LTE, and in encouraging individuals who do not currently exercise in their leisure-time to do so. This finding is consistent with previous work grounded in SDT and allied theories, which report that poorer perceived physical or athletic competence is associated with lack of engagement in LTE (e.g., Ntoumanis, 2001; Papaioannou et al., 2006; Sallis et al., 2000; Vlachopoulos et al., 1996). Previous research has demonstrated how the need for competence can be enhanced through facilitating learning climates that focus on the improvement of skills against self-referenced standards, rather than emphasising normative comparisons within a class or school (Ntoumanis, 2001), setting co-operative rather than competitive tasks (Standage et al., 2005b), and providing informational feedback relative to a desired, achievable standard rather than more personally evaluative judgements (Vansteenkiste & Deci, 2003).

Relatedness was also predictive of the maintenance of LTE confirming the importance of the quality of social interactions during sport and exercise. While this is consistent with previous research indicating the importance of social support in predicting physical activity levels (e.g., Deforche et al., 2004; Neumark-Sztainer et al., 2003a), identification of the importance of relatedness contributes additional information as to the specific elements within this broad concept of “social support” which may be responsible for bringing about

the positive effect. Research grounded within SDT demonstrates that the need for relatedness in school settings can be enhanced by focussing lessons on co-operative learning styles rather than competition between pupils (Standage et al., 2005a), and research in other areas suggests enhanced relatedness may stem from greater school engagement and connectedness (Allen, 2003). As such it may be promoted by approaches which increase school connectedness, such as through encouraging extra-curricular activities which involve interaction with teachers/coaches outside usual roles, and through events involving parents and families (Battistich et al., 2004).

#### **4.4.5 Longitudinal Analysis of Quality of Life**

In addition to the finding that there was no general decrease in LTE over the duration of the follow-up period to the present study, there was also no anticipated deterioration in QoL (e.g., Bisegger et al., 2005; Brossart et al., 2002; Drukker et al., 2006). One reason for this could be that the present study took account of *response shift* in the interpretation of findings, which was not considered by any comparable previous research. The present results are particularly important as so little QoL research with children and adolescents takes account of response shift, and as such the finding presents an original demonstration of the difference that such an approach could make. The next chapter presents a definition of the response shift phenomenon, an analysis of how it may have affected the results to this study, and discusses its wider implications to the present research thesis.

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## Exploring Response Shift in Quality of Life over a 12 Month Period in Healthy Adolescents.

### 5.1 Introduction

Chapter 4 examined a hypothesised cross-sectional model of the relationships between physical self-perceptions and the outcome measures of leisure time exercise and QoL. The participants were then followed up one year later to obtain repeated measures for a longitudinal analysis of the proposed relationships between constructs. However, the phenomenon of *response shift* in the longitudinal assessment of QoL data raises a potential threat to the internal validity of results. The following study sets out to define *response shift*, and to explore its impact in this healthy adolescent sample.

While the need to measure children's QoL is now broadly agreed (Eiser & Morse, 2001b; Skevington & Gillison, 2006), and the development of measures is well advanced (Eiser, 1997), the normative changes expected in QoL during childhood and adolescence have not been well documented. A large number of articles have been published reporting on the impact of illness and interventions on chronically ill or disadvantaged children (see Eiser & Morse, 2001b, for a review). However, the lack of research on the stability of QoL during the considerable social and biological changes of a healthy childhood and adolescence means there is no baseline against which to compare QoL change in response to non-normative life events.

In any assessment of QoL over a period of time in which a change or challenge to a person's QoL is expected to occur, there is a need to consider the occurrence of response shift (Schwartz et al., 2004). Response shift can be defined as "a change in a person's internal standard for determining his or her level of functioning on a given dimension" (Sprangers & Hoogstraten, 1989, p.285). The theory is illustrated by observations within health care settings, that despite continuing functional or social limitations experienced by patients after the onset of chronic disease or disability, patients still often report a surprisingly positive QoL (e.g., Breetvelt & Van Dam, 1991; Rapkin, 2000). After a period of adjustment to their new situation, many people report a level of QoL similar to, or even higher than that prior to an objective deterioration in their health. A study of the changes in personal goals following diagnosis for AIDS provides a good illustration of one way in which response shift could potentially bring about such an effect (Rapkin, 2000). Interviews were conducted at six monthly intervals with patients living with AIDS, to elicit

participants' views of how both their QoL and life goals were changing over time. Patients' goals were elicited through questions such as: "what are the main things you want to accomplish?", "what are the problems facing you that you want to solve", and "what commitments would you like to keep or let go of?" Little change in QoL was detected despite considerable changes in objective health, but 78% of the sample reported at least one change in their goals over time. A subsequent regression analysis demonstrated that changes in personal goals mediated the effects of health status change on QoL. Most of the goals patients added over time were related to daily demands, personal growth, and interpersonal relationships, all of which represent goals that can be achieved despite ill health. Thus, Rapkin concluded that the response shift observed reflected patients' ability to change their goals to become more achievable, in order to buffer their QoL. Specifically, he argued that people have attenuated reactions to events that are unrelated to their goals, and therefore, if they can adjust their goals to no longer be greatly affected by change in health status (e.g., once an individual has given up work due to ill health, work is no longer a goal to be fulfilled), then the negative impact of deteriorating health is much diminished. This example provides part of the explanation of why response shift is considered to be an adaptive process, stemming from people's innate tendency to construe their lives positively.

In 1999, Schwartz and Sprangers outlined a model of response shift in relation to QoL, describing how changes in reported QoL occur as a result of a shift in the criteria by which it is judged (Schwartz & Sprangers, 1999). The model assumes that response shifts are underpinned by behavioural (e.g., coping skills), cognitive (e.g., reframing expectations), and affective (e.g., detachment) mechanisms. Shifts can take place along any or all of three different axes: internal standards, values, or conceptualisation (Sprangers & Schwartz, 1999). The first of these, changes in an individual's internal standards, is termed *recalibration*, and occurs when an individual adjusts their expectations to enable them to be satisfied with a different degree of functioning. For example, following adjustment to the onset of a disability, a person may reclassify the health status they would consider as "good" to mean "well enough to carry out key activities of daily living unassisted", whereas prior to their disability they same label would only have been applied to perfect health. Recalibration can also be brought about through social comparisons, by changing one's comparison group to those worse or better off than oneself (Gibbons, 1999).

The second form of response shift represents a change in values, and is reflected by the re-ordering of the importance of different domains considered to contribute to QoL. This process is termed *reprioritisation*. This is illustrated by the example of a person suffering from a chronic illness who comes to place greater value on social relationships in



determining their QoL, and de-emphasise areas which were previously important to them, such as their physical health or work. Finally, *reconceptualisation* response shift refers to the cases where an individual redefines what QoL means to them. Thus, rather than engaging in a re-ordering of domains as indicated by *reprioritisation*, previous goals are discarded and/or new goals emerge. This type of response shift reflects the changes observed in the AIDS patients in the previous example, where new achievable goals were adopted which made an important contribution to their reconceptualised QoL (Rapkin, 2000). The three types of response shift describe the processes through which people are able to maintain a good level of subjective quality of life, despite outward signs of less preferable, or limiting life conditions (Sprangers & Schwartz, 1999).

Response shift presents challenges for both longitudinal research, and the use of QoL as an outcome measure for treatment or intervention, as it becomes difficult to isolate the effects of an intervention or the passage of time from usual variation in a person's evaluation criteria (Brossart et al., 2002). Therefore a means of taking account of and quantifying response shift is essential in interpreting findings from longitudinal QoL work (Bar-On et al., 2000; Rapkin & Schwartz, 2004). Schwartz and Sprangers (1999) propose a number of methods for measuring all three types of response shift, which include adjusting study design, the use of specific measurement tools and statistical analyses (Schwartz et al., 2004; Visser et al., 2005). These have since been expanded on and refined by others working in the field of QoL research (e.g., Oort, 2005; Rapkin & Schwartz, 2004) and provide a means to evaluate whether response shift has had an impact on results, and to explore the direction and the extent of these effects (Brossart et al., 2002). A recent meta-analysis of a number of methodologies employed in published research showed no evidence of any one means of assessing response shift being superior to another (Schwartz et al., 2006). However, key advantages and disadvantages of each were identified by Schwartz and colleagues and will form part of the discussions to follow.

### **5.1.1 Methods of Analysing Response Shift**

Recalibration, reprioritisation and reconceptualisation response shift can be measured through a variety of approaches: *individualised techniques*, which require one to one interviews and take an individual-centred approach to defining and measuring domains relevant to that individual's QoL; *preference based methods*, which assess the importance or value that an individual places on a given QoL dimension, requiring individuals to compare the favourability of hypothetical alternative states for their QoL; *design approaches*, which incorporate explicit changes to usual research design to directly assess response shift, and *statistical approaches*, which analyse trends in longitudinal data from original questionnaire responses without the need for additional information

(Oort, 2005; Schwartz & Sprangers, 1999). The present study focuses on design and statistical approaches which are more appropriate to large sample research.

#### **5.1.1.1 Measuring response shift through a research-design perspective**

Examples of a research-design approach included the *thentest*, and the *ideal scale* approach. The ideal scale approach is relatively time-consuming in that it requires participants to complete a measure twice at each time point. Items included on a standard QoL measure are completed first with respect to how a person would rate their life at the moment, and secondly, with regard to what their ideal rating would be. Response shift is assessed through comparing the ideal scale ratings between time points to provide information regarding change in internal standards and values. However, the most commonly used design approach in the existing response shift literature is the *thentest* (Schwartz et al., 2006).

The *thentest* is also referred to as a retrospective post-test, as it involves the comparison of pre-test, post-test and retrospective post-test scores to detect changes in scale calibration. In this approach, participants complete a QoL measure three times: once at an initial time point (referred to as pre-test score) and twice at a second time point, at which time they first complete the measure with respect to their current QoL (post-test) and once with a renewed judgement of how they were feeling at the previous occasion of QoL measurement (*thentest*). By completing the post-test and *thentest* at the same time, it is assumed that the items are being judged with the same internal standard of measurement (Schwartz et al., 2004). The difference between *thentest* and pre-test ratings is then computed, and a recalibration effect is judged to have occurred if the difference between ratings is significantly different from zero (Howard et al., 1979).

Sprangers et al. (1999) provide an example of the use of the *thentest* in a study of newly diagnosed breast cancer patients. Specifically, they measured QoL at the start and end of a programme of radiography treatment, and compared these changes with those of a clinical rating of fatigue. The results showed that a sub-group of patients (those who experienced less fatigue as the treatment progressed), retrospectively reported their QoL to have been better at the pre-test than they had rated it at the time, showing evidence of a change in internal standards. These quantitative assessments were followed up with qualitative interviews to elicit respondents' views of why such changes had taken place. Examples of the reasons given included the acknowledgment of a conscious change in comparison group (i.e., comparing themselves with an ill versus healthy group), and the correction of previous ratings which were retrospectively considered to be naïve, given patients' subsequent experience of far worse feeling states than they had imagined they could experience at the time of the first assessment.

Such qualitative exploration in support of quantitative findings provides good validation of response shift measures. However, *thentests* themselves have been criticised over concern that they are unduly influenced by recall bias (Schwartz & Sprangers, 2000). It may be unrealistic to expect individuals to remember as far back as the original QoL rating for which there is often no objective marker. Subsequently differences between responses made at two time points may be an effect of recall bias, or inaccurate memory. Schwartz et al. (2004) investigated this explicitly in a five year longitudinal study, by measuring retrospective ratings of highly subjective QoL domains expected to be subject to response shift (in this case, fatigue) alongside those which can be more readily quantified (in this case, ambulation). Agreement between *thentest* and pre-test ratings for the two domains were calculated, and the degree to which this was less than perfect (i.e., a kappa statistic <1) for ambulation was interpreted to result from recall bias, and the degree to which agreement was poorer for fatigue attributed to response shift (Schwartz et al., 2004). The results showed evidence of both recall bias and response shift. Recall bias was estimated as accounting for 22% in the variance between responses (i.e., kappa for ambulation =.78), and recalibration response shift was estimated to account for a further 17% of the variance. While such figures are relatively arbitrary, and cannot be generalised across samples, they provide support for the argument that the *thentest* measures more than recall bias, and that the effect of response shift can be partitioned from this to contribute a meaningful degree of information. However, the relatively large proportion of the difference in agreement between pre-test and *thentest* suggests that the use of this method of response shift assessment should be backed up either by assessment of the extent to which results could be attributed to recall bias, or by an alternative assessment of response shift which does not rely on the need for retrospective data.

#### **5.1.1.2 Measuring response shift through a statistical framework**

All three forms of response shift can be assessed through statistical modeling using structural equation modeling (SEM) or factor analysis (Armenakis, 1988; Oort, 2005). To assess response shift by SEM, a model is constructed to represent the relationships between the domains constituting QoL (latent variables), and the scales designed to measure them (observed variables). SEM models the mean and covariance structures among variables rather than scores of individual participants, so provides a measure of response shift on a group rather than individual level (Byrne, 2001). In the SEM approach to response shift detection, recalibration, reprioritisation, and reconceptualisation are operationalised as changes in specific factor means, common factor loadings, and common factor patterns, respectively (Oort, 2003).

While statistical measures have the advantage over self-report techniques of being free from memory effects and recall bias, they have much poorer face validity. Thus, when results do not coincide, researchers are more likely to accept other evidence in preference to statistical analysis (Ahmed et al., 2005). This is especially so as statistical techniques calculate changes only at a group level, and thus may not be sufficiently sensitive to detect change when there is variability in the direction of individual responses. Therefore, a combination of statistical and self-report techniques is recommended to obtain greater confidence in the type and extent of response shift present (Schwartz et al., 2006).

A meta-analysis of studies investigating response shift published in 2006 identified 28 research papers, of which 19 provided sufficient data to compute effect sizes of the response shifts detected (Schwartz et al., 2006). Fifteen of the final 19 studies analysed assessed response shift through use of the *thentest* with adult clinical populations, including a range of patient groups with different chronic health conditions, at different points since diagnosis, with sample sizes ranging from 21 to 199. Studies assessing response shift in proxy reports of QoL were also included, including one study investigating proxy reports of QoL in infants (Timmerman et al., 2003) which calls into question how homogeneous the final sample was to justify the amalgamation of the results. Overall, the meta-analysis reported a small but significant effect size for recalibration response shift, although confidence intervals for the effect size of some studies included zero, indicating that the reliability of this outcome was low. There were slight differences in the extent of the effect sizes by domain, with the greatest effect found for fatigue (aggregate mean  $d = .31$ ), followed by global QoL ( $d = .30$ ), physical role limitation ( $d = .23$ ), with only marginal effects found for psychological well being ( $d = .12$ ) and pain ( $d = .07$ ). Such a meta-analysis cannot be considered definitive, as it was so heavily weighted towards analysis of recalibration response shift through use of the *thentest* (Schwartz et al., 2004; Schwartz et al., 2006). However, as the results were independent of sample size, quality rating, study design, disease group or method of evaluating response shift, it provides a useful systematic approach to assessing the impact of response shift on longitudinal QoL measurement, for which even small effects may make a considerable contribution to the implications of the assessment of true change.

Response shift has not been widely studied in children and adolescents (De Civita et al., 2005). To date, only one study exploring response shift in a child or adolescent population could be located through online search engines, but this provided solely proxy reported data (Brossart et al., 2002). Disappointingly, other studies which acknowledge the possibility of a response shift effect in their findings have so far stopped short of attempting to measure the phenomenon (e.g., Wee et al., 2005). However, it is potentially

even more important to consider at this age than in adulthood when it is assumed by the absence of significant life events that QoL is relatively stable. Children and adolescents face an ongoing series of potentially significant changes in their lives which could present challenges to QoL. At different stages of development these could be biological (e.g. reaching puberty), cognitive (e.g., ability to engage in social comparisons), educational (e.g., facing important exams), environmental (e.g., transition to senior school) and social (e.g., developing romantic relationships) (DiClemente, 1996; Williams et al., 2002). Thus, in adapting to these numerous challenges to their QoL over childhood (DiClemente, 1996), it is possible that the factors that children and adolescents consider to constitute their QoL, and the relative importance of these domains, may be far less stable than in adulthood.

Children's cognitive development will have a significant impact on how they understand the measurement tools used to assess their QoL (Tinsley, 2003), and on the information on which they base their judgements (Carey, 1987). Until early adolescence (i.e., age 11 to 12) children may be cognitively unable to engage in meaningful social comparisons (De Civita et al., 2005), and thus are unlikely to shift their QoL assessments in response to a change in comparison group, which is considered a cornerstone of all types of response shift in adults (Gibbons, 1999; Sprangers & Schwartz, 1999). Thus, just as QoL measures are not directly transferable for use with children and adolescents (e.g., Herdman et al., 2002, see section 2.5 for a full discussion), it is also likely that some methods of measuring response shift used with adults may not be directly transferable to children. In the light of these potential limitations, would be prudent to employ a combination of techniques to provide a measure of concurrent validity of research findings until response shift methodology has been validated with children and adolescents.

The present study therefore set out to assess the extent of response shift in the self-reported QoL ratings of a cohort of healthy adolescents over a period of one year, between the middle of Year 9 at a UK senior school (age 14), and the middle of Year 10 (age 15). By the age of completion of the first set of measures (mean age = 14.06, minimum age = 13.05) the majority, if not all of the sample were expected to have completed the final stage of cognitive development (Tinsley, 2003). Thus, comprehension and understanding of the measure was expected to remain relatively stable. However, factors such as increasing physical maturation, changes in levels of responsibility (e.g., brought about by the onset of studying towards GCSE level exams), and increasing life experience in the period between the two measurement occasions were anticipated to bring about considerable changes in values and priorities. Predictions were made with relation to all three types of response shift.

1) *Recalibration response shift*. Previous research conducted with adults in response to changes in health status suggests that recalibration effects are common, and can occur in different directions for different domains (Schwartz et al., 2006). Reports from adolescent QoL literature, including the single study accounting for response shift in its findings, consistently report an age-related decline across domains in children's QoL (e.g., Bisegger et al., 2005; Brossart et al., 2002; Drukker et al., 2006), however, little information is available as to the likely trajectory of change expected within domains. In view of the lack of related research on which to base a hypothesis for the present study, a null hypothesis was therefore tested predicting that there would be no normative change in internal standards.

2) *Reprioritisation response shift*. A reprioritisation was predicted to occur over the period of one year due to normative changes in the importance of different life domains during adolescence. In line with the literature of adolescent development (see section 2.3), it was predicted that there would be an increase in importance of four domains. The peer and bullying domains were expected to be reprioritised to have greater importance reflecting the increasing importance of peer judgements in forming the basis of global self-attributions (Craft et al., 2003; Harter, 1990). The autonomy domain was predicted to increase in importance as a reflection of adolescents' increasing self-awareness and striving to develop a consistent sense of self as distinct from their parents (DiClemente, 1996). The financial domain was expected to increase in importance both as it represents a marker of independence, and therefore autonomy, and as it can be inferred to be important in achieving peer acceptance, for example determining if an individual feels financially able to wear the "right" clothes. It was predicted that the family relationship and school domains would decrease in importance, in line with a decrease in the reliance on adult judgements for self-attributions and self-concept (Moshman, 1999). No change was expected in the importance of the domain of physical health, as it was considered that this would be of lesser importance to those experiencing good health, and greater importance to those with poorer health, regardless of age. Similarly, although previous research indicates that the domains of self-perceptions, psychological well-being, and mood and emotions, may deteriorate in adolescence (e.g., Jacobs et al., 2002; Bacchini & Magliulo, 2003), no reprioritisation of their relative importance as a function of age was predicted.

3) *Reconceptualisation response shift* was not expected to take place, as although the relative importance of domains would be expected to change, it was expected that they would all be of continued meaningful importance over this period. In part this is due to the expectation that over a period of one year reconceptualisation would require a greater shift in values than is likely to occur in the absence of significant life events.

Further support for this hypothesis lies in the thoroughness with which the Kidscreen QoL instrument used in the research was developed (Herdman et al., 2002; Ravens-Sieberer et al., 2005). The measure was developed across 13 countries involving children and their carers from the ages of eight to 18. The 10 domains identified resulted from agreement among children and adolescents from the entire age range, verified by statistical evidence confirming consistent factor structure across age groups (Ravens-Sieberer et al., 2005). Therefore, it was predicted that all domains would be significant and meaningful indicators of QoL at both time points.

The analysis of response shift served two purposes for the present thesis. Firstly it is necessary to account for response shift effects in the analysis of longitudinal data, so was undertaken to improve the validity of results. However, it could also provide insight into the central hypothesis of the present thesis. It has been proposed that adolescents' exercise behaviour (as a subgroup of behaviour in general), changes as a result of either a shift in adolescents' goals, or a change in the behaviours which meet these goals. Reprioritisation and reconceptualisation response shift both reflect such shifts in priorities. Therefore, this chapter is not only useful in allowing greater confidence in the reliability or meaningfulness of the QoL outcome, but is also of use in exploring whether the shift in values assumed to underpin behaviour change is evident in the present sample.

## **5.2 Method**

### **5.2.1 Participants**

Complete data were obtained from 356 students from three schools in the South West of England, who were already enrolled on a wider longitudinal study (see Chapter 4, section 4.2.1). The sample comprised 180 boys (51%) and 176 girls, with mean age of 14.05 years (SD = .31) at time 1, and mean age 14.9 years (SD = .30) at time 2. Due to practical reasons (i.e. time allowed for data collection in one school) only participants from two schools completed the *thentest*, for which complete data was obtained from 279 students. Statistical measures of response shift, however, were available for the full sample of 356 students.

### **5.2.2 Measures**

QoL was assessed using the Kidscreen self-report questionnaire (see section 4.2.2, Ravens-Sieberer et al., 2005). The measure consists of 52 items assessing ten dimensions of QOL established following consultation with adolescents, their parents and carers in over 13 European countries (Herdman et al., 2002). The domains included are physical well-being, psychological well-being, mood and emotions, self-perceptions, autonomy, family relationships, relationships with peers, school environment, bullying, and

financial resources. Responses relating to participants' satisfaction with items were indicated on a five point Likert-type scale, anchored by 1 (*never or not at all*) to 5 (*always or extremely*). In line with the author's recommendations (Kidscreen Group, 2006), the results were then transformed to Rasch scores (see Appendix 2.4 for a full description).

At both time points all participants were asked to rate how important they considered each domain in determining their QoL. These items were constructed for the present study following consultation between the principal researcher and a senior academic expert in the field of QoL. Similar wording to that used in the Kidscreen questionnaire was retained to provide consistency. Each importance question was inserted directly after the Kidscreen domain to which it referred, to make it clear the question related to this specific group of items. For example for the bullying domain, the importance item was phrased "*How important to you is it to be free from bullying?*" Responses were recorded on a five point Likert scale, consistent with the remainder of the Kidscreen questionnaire. The full list of importance items is available in Appendix 4.1. The reason for including the importance items was to obtain a self-report of domain importance at each point in time, which could be compared with statistical means of assessing a *reprioritisation* response shift.

The *thentest* (Howard et al., 1979) consisted of a sub-sample of the Kidscreen items, to reduce the response burden for participants in line with previous research (Schwartz et al., 2004). Accordingly, the items selected were those within each domain with the strongest item-scale correlations at time 1 (Table 5.1). The original Kidscreen items are preceded by the instruction "Thinking about the past week...", therefore for the *thentest* items were preceded by the instruction "Thinking about this time last year...", and rephrased into the past tense. Thus, the corresponding *thentest* item for the Kidscreen item "Have you been able to run well?" became "Thinking about this time last year, were you able to run well?" A full list of items included in the *thentest* is available in Appendix 5.1.

A free-response question was included asking participants to report if they had experienced any significant change in their life since the researcher's visit to the school last year. Examples were provided to include any changes in where they lived, their health, family or friends etc., that participants considered may have had an impact on their answers to the questions in the Kidscreen questionnaire.



**Table 5.1** Items selected for the test and item-total correlations

<b>Domain</b>	<b>Item</b>	<b>Item-total Correlation</b>	<b>Range of item-total correlations</b>	<b>Cronbach Alpha for total domain</b>
Physical health	Have you been able to run well?	.65	.56-.64	.82
Psychological well-being	Have you felt satisfied with your life?	.75	.64-.72	.89
Moods & Emotions	Have you felt fed up?	.74	.51-.71	.87
Self Perception	Would you like to change something about your body?	.59	.35-.58	.76
Autonomy	Have you been able to do the things that you want to do in your free time?	.78	.54-.71	.86
Family relationships	Have you been able talk to your parent(s) when you wanted to?	.76	.70-.74	.90
Peers	Have you and your friends helped each other?	.71	.54-.70	.86
School	Have you got on well at school?	.76	.60-.76	.89
Bullying	Have other girls and boys bullied you?	.78	.62-.78	.85
Financial	Have you had enough money to do the same things as your friends?	.82	.80-.81	.90

### **5.2.3 Procedure**

Participants completed the Kidscreen QoL questionnaire at the end of a battery of measures, at the start of a school PE lesson. This took place in quiet conditions either in the school gym (two schools) or classrooms (one school), in groups of 20 to 60. The purpose of the research was presented by the principal researcher, and students were informed that there were no right or wrong answers, and that their responses would be treated confidentially. Students were asked to respond independently of their friends, and as honestly as they could. The completion of the full battery of measures (including *thentest*) took approximately 30 minutes, during which time the researcher remained available to answer any arising queries. At the second time point in similar conditions one year later, participants again completed the Kidscreen, followed by the *thentest* (Howard et al., 1979).

### **5.2.4 Analysis**

#### **5.2.4.1 Assessment of Recalibration response shift**

Recalibration response shift was assessed through the use of a *thentest*. In recognition that QoL is a multidimensional construct, and that important information can be lost if dimensions are condensed to form a single index (WHOQOL, 1995b), the analysis was calculated for each domain scale separately. Recalibration is judged to have taken place if the time 1 pre-test scores of a measure are significantly different from retrospective *thentest* scores. This effect can then be partitioned from the real effect of change, represented by the difference between *thentest* and post-test scores.

A mixed model analysis was used to calculate the significance of differences between time points, as fully described in section 4.2.4. This analysis tests a linear model comprising both fixed (i.e., time) and random effects (i.e., individual differences) which provides greater power to detect an effect than standard repeated measures ANOVA (Verbeke & Molenberghs, 2000).

A secondary test of recalibration response shift was provided through the statistical approach of structural equation modeling (SEM), which provides a concurrent test for all three types of response shift. In line with previous refinement of statistical procedures in testing response shift in QoL (Armenakis, 1988; Oort, 2005), a four step approach was taken for the specification and testing of a model of QoL. In step one a measurement model is specified and tested to ensure that it has an acceptable fit to the data. Step two involves testing the invariance of the model over time, under the hypothesis that there is no response shift effect. If the model is not invariant, a response shift of some sort is inferred. Step three follows a process of relaxing model constraints to detect in which

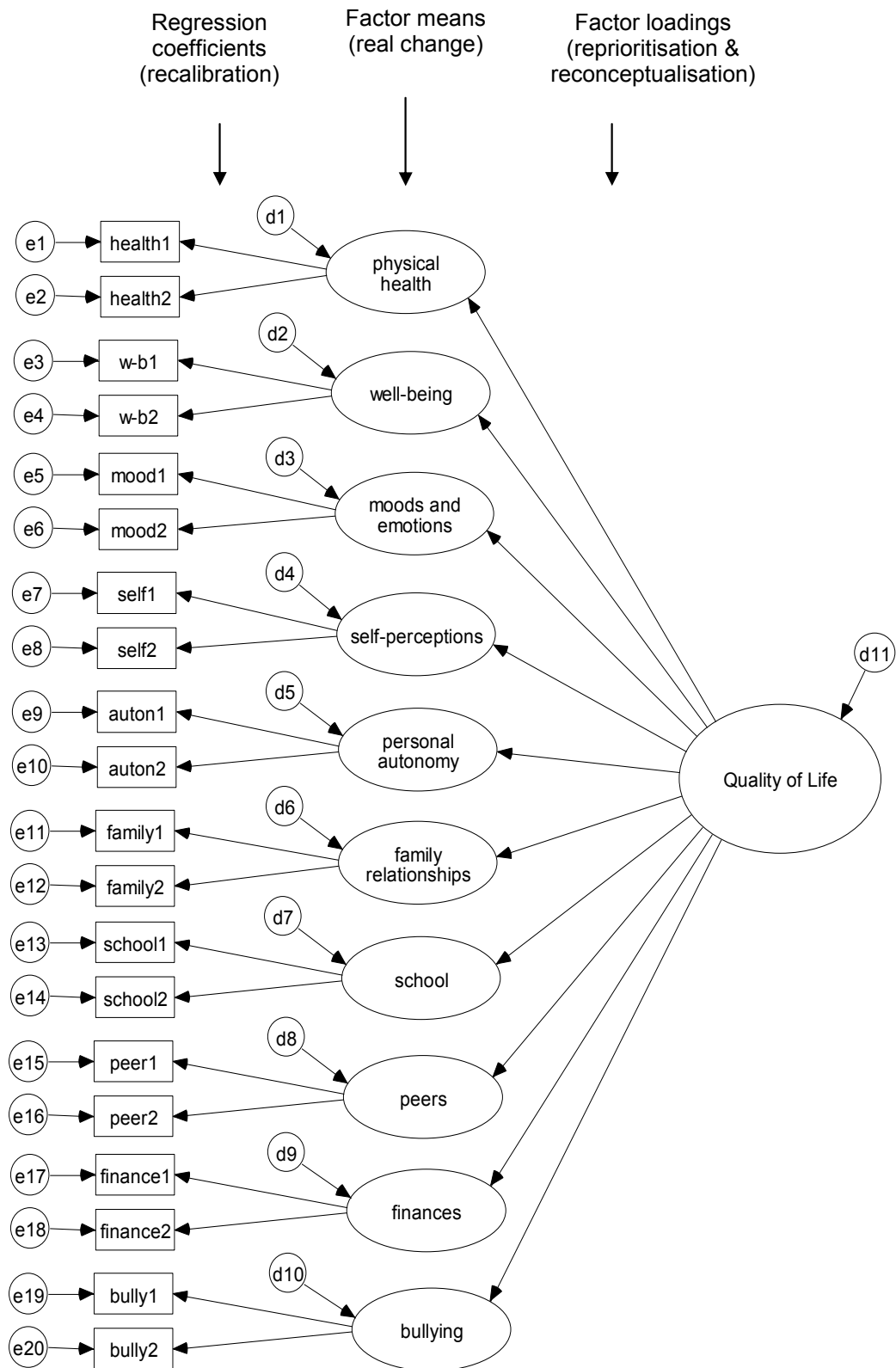
parameters a difference is detected, and thus which type of response shift has taken place. The final step is a test of true change in QoL conducted through comparing mean values of each QoL domain (Oort, 2005). The model specified in this first step of the present analysis is displayed in Figure 5.1.

The Kidscreen questionnaire items were used as the observed variables in the model, however, to ensure a ratio of 5:1 participants per parameter estimated was achieved the number of parameters to be estimated was reduced by randomly parcelling questionnaire items into two indicators for each domain (a final ratio of 8.5 participants per estimated parameter was obtained) (Bentler & Chou, 1987). This approach to the analysis of complex models is consistent with previous psychological research (Reinboth et al., 2004; Standage & Gillison, in press). Each pair of observed variables loaded onto its respective QoL domain, which were represented in the model as latent factors. These in turn, indicated the overall factor of QoL. The model was tested using the robust maximum likelihood estimation using the statistical package Amos (Version 5; Arbuckle, 2003). The overall fit was examined using Chi-Square Test ( $\chi^2$ ), for which a non-significant  $\chi^2$  indicates an acceptable fit of the model to the sample data. The  $\chi^2$  statistic is strongly influenced by sample size, and can lead to high rejection rates for analyses of small  $N$  (Marsh et al., 1998), therefore the adequacy of the model fit was further tested through generally accepted thresholds of a number of fit indices. These were the CFI (>.95), and the IFI (>.95) which compare the fit of the model to a hypothetical case in which all variables are unrelated, the Standardized Root Mean Square Residual (SRMR, desirable values <.08) and the root mean square error of approximation (RMSEA, desirable values <.06) which estimate the lack of fit in a model (Hu & Bentler, 1999b).

Model invariance (Step 2) was tested through setting constraints on the parameters indicative of response shift to be invariant over time, which is assessed through the presence/absence of significant change in fit indices following additional constraints (Marsh et al., 1998). The parameters predicted to be indicative of response shift are factor loadings, intercepts, and residual variances. Additional constraints were added to common factor means and variances to investigate the change in QoL independent of response shift, i.e., to assess true change over time.

Evidence for *recalibration* response shift is provided in one of two ways. First, if recalibration is uniform (i.e., all response shift occurs in the same direction) then there will be differences in means of the observed variables (i.e., questionnaire scores) that cannot be attributed to the changes in the mean of the common factor (i.e., real change). If recalibration is not uniform, as response shift has occurred in opposite directions for

**Figure 5.1: Structural Equation Model of covariance structure of QoL domains**



different individuals, then a significant change will be observed in the variances of the observed variables (i.e., variances of scores) that is not attributable to change in the common factor variances (i.e., real changes in different directions detected in the sample).

#### **5.2.4.2 Assessment of reprioritisation response shift**

Reprioritisation response shift was first tested through direct self-reports of the importance of domains. Scores were obtained using a Likert scale rather than through a ranking task, to allow participants greater flexibility in attributing importance to domains, rather than forcing potentially arbitrary ranks among domains. As in the recalibration analysis described previously, a *thentest* was also included to assess recalibration of importance ratings. The outcome of this test was used to judge whether pre-test or *thentest* importance scores were more appropriate to use in examining the full effect of time on self-reported importance of QoL domains. Reprioritisation was judged to have occurred if the patterns of importance ratings changed significantly over time, such that there was a difference in the domains listed as the most, and least important. The significance of change in self-reported importance ratings was calculated through a mixed modeling approach (see Chapter 4, section 4.2.4.2).

Reprioritisation was assessed statistically through the SEM method described in section 5.2.4.1. Evidence for reprioritisation response shift is detected through changes in the values of factor loadings of observed variables. A change in factor loading suggests that a particular observed variable has become more or less indicative of the concept which it is intended to measure. SEM invariance testing thus allows a comparison of the fit of the data to a hypothesised factor structure at two time points.

#### **5.2.4.3 Assessment of reconceptualisation response shift**

Reconceptualisation response shift was assessed through testing the invariance of zero order and non-zero order of factor loadings over time onto the latent variable of QoL (Oort, 2005). An additional preliminary assessment of reconceptualisation shift was conducted through scrutinising self-reported importance ratings, as outlined in the research-design method of assessing reprioritisation. While evidence of reprioritisation lies in a change in the relative importance of domains to one another, evidence for reconceptualisation is provided if there is a change in which domains are of any importance at all. Using self-report techniques, zero or non-zero order of importance ratings was assessed through examination of 90% confidence intervals (CIs). As the range of scores was from 1 to 5, CIs containing 1 were considered to be of zero order, and to reflect domains of no significant importance for QoL at that point in time.

A statistical test of reconceptualisation was conducted by firstly assessing the invariance of factor loadings through SEM, and subsequently through scrutiny of the differences between factor loadings to examine which were significantly different from zero at each time point. Reconceptualisation was considered to have occurred if there was a change in the zero and non-zero order ratings of any domain, indicating that domains that were important at time 1 became unimportant at time 2, or vice versa.

### 5.3 Results

Scores for the ten domains of the Kidscreen were calculated through Rasch modeling, in line with the author's recommendations (The Kidscreen Group, 2006). To demonstrate the results that would be obtained without consideration of response shift, the mean scores obtained at the two time points are displayed in Table 5.2. The analysis revealed a deterioration for eight of the ten quality of life domains over the course of a year. Statistically significant reductions emerged in three domains; physical health, psychological well-being, and autonomy. There was a significant improvement in the domain of bullying (i.e., participants were less likely to report being bullied), and an improvement in the peer domain, although this did not reach statistical significance.

**Table 5.2 Comparison of Kidscreen domain scores at time 1 and time 2 to show change in QoL scores over one year**

QoL domains	Time 1		Time 2		Mixed Model F test	$d^a$
	N <sup>a</sup>	Mean (SD)	N	Mean (SD)		
Physical health	342	0.29 (.94)	338	0.15 (1.04)	F(1,336)=5.72*	.13
Psychological well-being	350	1.39 (1.74)	345	1.19 (1.81)	F(1,349)=4.09*	.21
Moods & Emotions	353	1.20 (1.21)	342	1.19 (1.35)	F(1,345)=.07	.02
Self Perception	351	0.35 (.93)	338	0.31 (.88)	F(1,338)=.71	.04
Autonomy	351	1.27 (1.49)	339	0.74 (1.41)	F(1,345)=33.65**	.53
Family relationships	345	1.14 (1.71)	338	1.01 (1.86)	F(1,337)=2.24	.14
Peers	347	1.26 (1.30)	333	1.31 (1.42)	F(1,339)=.20	.38
School	351	0.11 (1.29)	333	0.07 (1.31)	F(1,337)=.56	.05
Bullying	347	1.30 (1.47)	340	1.49 (1.50)	F(1,344)=5.80*	.19
Financial	346	1.14 (2.07)	342	1.08 (2.18)	F(1,344)=.23	.06

Note: \* $p < .05$ , \*\* $p < .001$ ; <sup>a</sup> $d$  = estimate of size of time effect; small  $d > .2$ , moderate  $d > .5$ , large  $d > .8$ ; (Cohen, 1988). <sup>a</sup> Ns reflect all present at each time point, only those with complete data were included in the analysis.

Sixty one adolescents (17%) reported experiencing a significant life event between the measurement occasions. The most common event reported was death of grandparents (26%) or more distant family members, followed by changes in friendship groups (19%), and change in household (e.g., moving house, birth of sibling, sibling leaving home). There were no reports of significant change in health, but other notable significant events were parental divorce (4 participants), onset of bullying (3 participants), and significant weight change (4 participants). In recognition of the subjective nature of what an individual considers is a significant life event no attempt was made to grade severity of life events. Non parametric tests were conducted to compare the difference in QoL scores at both time points, and change in scores between those reporting a significant event, and the remaining sample (Appendix 5.2). There was no difference between the two groups, and therefore all participants were retained in the analysis to reflect a realistic cohort of healthy adolescents.

### **5.3.1 Test of Response Shift through Research-Design Methods**

#### **5.3.1.1 Assessment of recalibration analysis (*thentest*)**

Recalibration response shift was tested by establishing whether the difference between ratings made at time 1, and retrospectively at time 2 (*thentest*) were statistically different from zero. As only a sub-sample of questionnaire items were used for the *thentest* measure, change was assessed in these individual items only, rather than between overall domain means. There were significant differences between pre-test and *thentest* scores for three domains: mood and emotions, autonomy, and peers (Table 5.3). On average, participants retrospectively judged the peer domain to be better than they had rated it at the time, indicating that good QoL was easier to achieve at the second time point. However, mood and emotions, and autonomy were rated as being poorer than they had been considered at the time, suggesting that for these domains, a good QoL rating was more difficult to achieve. Thus, the results for seven out of ten domains were in line with the hypothesis that participants would not experience a change in their internal standards. Three domains revealed a significant recalibration of internal standards contrary to this prediction, although of only small effect size.

To consider the difference brought about by recalibration response shift in final outcomes, the *full effect* of the changes in QoL overtime was assessed through comparing post-test ratings with *thentest* scores (Schwartz et al., 2004). These adjusted comparisons revealed an improvement in the domain of bullying (i.e., less bullying reported) but significant decreases in quality of life for two domains: physical health, and self perceptions (Table 5.4). All significant differences were of a small effect size. Thus, accounting for recalibration response shift through the use of a *thentest*, the full effect of time on QoL was revised with the result that deterioration in QoL was detected in one

additional domain (self-perceptions), and two domains considered previously to have deteriorated (psychological well-being and autonomy) were found to remain stable. The improved QoL rating for bullying was upheld.

**Table 5.3 Comparison of mean scores for Kidscreen items at pre-test, and matched *thentest* items, to show recalibration response shift**

Domain	Pre-test Mean (SD) <sup>a</sup>	Thentest Mean (SD)	Mixed Model F test	d <sup>b</sup>
Physical health	3.39 (.91)	3.40 (1.01)	F(1,270)=.32	.04
Psychological Well-Being	3.61 (1.05)	3.57 (1.00)	F(1,273)=.20	.07
Moods & Emotions	3.25 (.98)	2.91 (1.12)	F(1,258)= 19.30***	.18
Self Perceptions	2.95 (1.17)	2.95 (1.21)	F(1,260)= .03	.03
Autonomy	3.94 (1.00)	3.72 (.92)	F(1,283)= 9.29**	.24
Family Relationships	3.61 (1.81)	3.61 (1.15)	F(1,266)= .001	.01
Peers	3.69 (.98)	3.86 (.95)	F(1,278)= 4.22*	.11
School	3.51 (1.01)	3.39 (.97)	F(1,264)= 3.54	.08
Bullying	3.17 (1.05)	3.04 (1.16)	F(1,249)= 3.50	.14
Financial	3.74 (1.02)	3.60 (1.05)	F(1,263)= 2.18	.17

\*p<.05; \*\* p<.01; \*\*\* p<.001

<sup>a</sup> Note: as ratings refer to individual items, not domain scores, the units differ from table 5.1

<sup>b</sup> d =estimate of size of time effect: small d >.2, moderate d >.2, large d >.8

### 5.3.2.1 Assessment of reprioritisation and reconceptualisation response shift

Preliminary assessment of self-rated importance ratings provide a useful double check of the face validity of statistically derived results. Mean values of importance ratings were calculated at both time points, and tested for change over time (post-test – *thentest*)<sup>7</sup> using a repeated measures mixed modeling approach (see Table 5.5). In this sample, there were significant increases in the importance of five domains: physical health, school, peers, family relationships and bullying. As such, the anticipated increases in the

<sup>7</sup> In order to illustrate the changes in importance attributed to each domain at time 1 and time 2, correcting for potential recalibration response shift, a *thentest* of pre-test items was also conducted for importance scores. A significant recalibration effect was found for all domains, which reflected a shift in internal standards to the effect that all 10 domains were considered less important retrospectively (according to the *thentest*) than they were at pre-test (Table 5.5).



**Table 5.4 Comparison of mean scores for Kidscreen items at post-test, and matched thetest items, to show full effect of QoL change**

<b>Kidscreen Domain</b>	<b>Thetest Mean (SD)</b>	<b>Post-test Mean (SD)</b>	<b>Mixed Modeling F test</b>	<b><math>d^a</math></b>
Physical health	3.40 (1.01)	3.26 (1.00)	F(1,262)= 5.88*	-.14
Psychological Well-Being	3.57 (1.00)	3.64 (1.03)	F(1,256)= .90	.10
Moods & Emotions	2.91 (1.12)	3.08 (1.03)	F(1,252)= 2.16	.10
Self Perceptions	2.95 (1.21)	2.69 (1.13)	F(1,246)= 12.71***	-.23
Autonomy	3.72 (.92)	3.65 (1.05)	F(1,265)= 1.84	-.05
Family Rrelationships	3.61 (1.15)	3.51 (1.25)	F(1,258)= 3.21	-.05
Peers	3.86 (.95)	3.92 (.91)	F(1,256)= .80	.08
School	3.39 (.97)	3.29 (.99)	F(1,269)= 1.46	-.06
Bullying	3.04 (1.16)	3.29 (1.06)	F(1,243)= 16.09***	-.25
Financial	3.60 (1.05)	3.59 (1.17)	F(1,268)= .07	.04

\*p<.05; \*\* p<.01; \*\*\* p<.001

<sup>a</sup>  $d$ - estimate of size of time effect: small  $d > .2$ , moderate  $d > .2$ , large  $d > .8$

importance of the peer, and bullying domains were upheld, but the predicted increase in the autonomy and financial domains were not supported. Contrary to the hypotheses, the family relationship and school domains also significantly increased in importance, as did the physical health domain for which no change was predicted. There was no reciprocal decrease in importance in any domain.

Comparison of the ranks of the importance of domains across time did not suggest extensive reprioritisation. Despite statistically significant change in the importance of five domains when ranked according to the strength of importance ratings, there was little change in the rank of domains relative to one another. The three most highly rated domains at time 1 (according to *thetest* ratings and pre-test scores) were within the top four at post-test, and the two least important domains remained the same on all measurement occasions.

**Table 5.5 Self-reported importance of each of the Kidscreen QoL domains for comparison between pre-test, post-test, and thetest.**

	Pre-test <sup>a</sup>			Post-test			Thetest		
	Rank	Rating (SD)	95% CI	Rank	Rating (SD)	95% CI	Rank	Rating (SD)	95% CI
Peers	1	4.76 (.53)	3.70 - 5	1	4.46 (.84)	2.78 - 5	1	4.23 (.90) <sup>****</sup>	2.43 - 5
Family relationships	2	4.57 (.77)	3.43 - 5	2	4.11 (1.04)	2.03 - 5	3	3.96 (1.09) <sup>*</sup>	1.78 - 5
Autonomy	3	4.47 (.64)	3.19 - 5	4	4.01 (.87)	2.27 - 5	2	3.97 (.89)	2.19 - 5
Bullying	4	4.43 (.93)	2.57 - 5	3	4.05 (1.19)	1.67 - 5	=6	3.77 (1.33) <sup>****</sup>	1.11 - 5
Self perceptions	5	4.23 (.84)	2.55 - 5	7	3.84 (.93)	1.98 - 5	5	3.83 (.95)	1.93 - 5
Psychological well-being <sup>b</sup>	6	4.18 (.85)	2.48 - 5	5	3.98 (.83)	2.32 - 5	4	3.91 (.89)	2.13 - 5
Physical Health	7	4.17 (.75)	2.67 - 5	6	3.86 (.88)	2.10 - 5	=6	3.77 (.92) <sup>*</sup>	1.93 - 5
Financial	8	4.08 (.89)	2.30 - 5	8	3.64 (.98)	1.68 - 5	8	3.70 (.97)	1.76 - 5
School	9	3.82 (1.01)	1.80 - 5	9	3.60 (.98)	1.64 - 5	9	3.46 (.95) <sup>**</sup>	1.56 - 5

\*p<.05; \*\* p<.01; \*\*\* p<.005; \*\*\*\* p<.001 for differences between time 2 versus thetest scores

a - all differences between domains at time 1 vs. time 2, and time 1 vs. Thetest were significant at the p<.01 level, analysed using mixed modeling

b - mood and emotion and psychological well-being were combined for importance ratings

There was also no evidence to suggest that a reconceptualisation of QoL had taken place. All mean values remained relatively stable in absolute terms, i.e., between 3.60 and 4.46 on a five point scale at post-test, with no rating below 3.46. On the initial Likert measurement scale, a score of 3 represented *moderately important*, and 4 *very important*. Thus, on average the degree of change in importance rating was insufficient to suggest systematic reconceptualisation of the constituent domains of QoL. Confidence intervals (95%) were computed from the mean and standard deviation of domain importance ratings, and demonstrated that no domain was of zero order (i.e., included 1 "not at all", within the confidence interval) therefore indicating that all domains were of importance to overall QoL. Thus, the preliminary assessment of self-reported importance ratings of the QoL domains showed no evidence of reprioritisation or reconceptualisation response shift taking place.

### **5.3.2 Statistical Tests of Response Shift**

All three forms of response shift were analysed through the testing of a model of the factor structure of QoL for invariance over time. A basic model was constructed specifying pathways loading onto the latent variable of QoL from all 10 QoL domains, each of which was indicated by observed questionnaire scores. The model was first tested for fit to the data without any constraints, and subsequently tested for invariance across time by sequentially constraining regression coefficients from item parcels to domain variables (recalibration), and subsequently the factor loadings of the latent variables (reprioritisation and reconceptualisation).

The CFA for the latent variable of QoL showed a less than adequate fit to the data in the unconstrained model (Figure 5.1;  $\chi^2=1031.291$ , 345,  $p<.01$ ; IFI=.93, CFI =.93; SRMR =.079; RMSEA =.039). Therefore modification indices were considered to suggest additional pathways which would improve the fit of the data to the model. As SEM relies on the respecification of models to be based on theory, and not purely data driven, only modifications that were theoretically justifiable were accepted. Three disturbance terms for latent variable domains were allowed to covary: the mood and emotions term with those both for bullying and self-perceptions, and the terms for autonomy and the peer domain. The mood and emotions domain is conceptually linked to the outcomes of bullying through the documented negative impact that bullying has on mental health (Dake et al., 2003), and to self-perceptions through the association between self-esteem and physical self-perceptions and affect (Patrick et al., 2004a). A link between the autonomy and peer terms was included as there was expected to be overlap between the provision of autonomy, and the degree to which adolescents felt able to spend time with their peers and were supported to take part in the activities with them. The inclusion of these three additional paths increased the model fit to an acceptable level ( $\chi^2=837.68$ , 320,  $p<.01$ ; IFI

=.95, CFI =.95; SRMR =.070; RMSEA =.048 (90% CI: .044 - .052)). The factor loadings of each of the 10 QoL domains at time 1 and time 2 in the adjusted unconstrained model are shown in Table 5.6.

**Table 5.6 Standardised factor loadings of QoL domains on a latent factor of overall QoL at time 1 and time 2 (listed in order of strength of factor loading at time 1)**

	<b>Time 1 Factor loading</b>	<b>Time 2 Factor loading</b>
Psychological well-being	.852	.853
Family relationships	.750	.781
Moods and emotions	.746	.697
Autonomy	.677	.666
School	.606	.685
Financial	.565	.656
Physical health	.547	.424
Peers	.487	.544
Bullying	.419	.360
Self-perceptions	.214	.150

All factor loadings were of non-zero order (i.e., their respective regression coefficients for pathways loading onto QoL were statistically different from zero), implying that all 10 domains of QoL were indicative of overall QoL at both time points<sup>8</sup>.

Table 5.8 shows the effect of adding sequential constraints to the model, to test the invariance of the factor and covariance structure over time. The changes in fit indices following these constraints were minimal for each additional constraint, suggesting that the factor structure of QoL in the present sample was invariant over time (Marsh et al., 1998). The invariance of measurement weights provides evidence of the absence of recalibration; the invariance of structural weights provides evidence of the absence of reprioritisation. Thus, the statistical analysis of change over time within this sample indicates that there was no meaningful response shift of any type.

<sup>8</sup> Although statistically significant, the factor loading of self-perceptions onto QoL was smaller than that conventionally accepted to indicate inclusion within a given factor, suggesting it may relate more strongly to a different construct. Observation of the covariance matrix supports this finding (Table 5.7), as the covariance is significant between all domains at both time points, except for the nine covariances between self-perceptions and other QoL domain.

**Table 5.7 Covariance between QoL domains at time 1 (Top right hand figures) and time 2 (bottom and left hand figures)**

	1	2	3	4	5	6	7	8	9	10
1) Physical health	-	0.27	0.19	-0.00*	0.25	0.23	0.25	0.14	0.20	0.19
2) Psychological well-being	0.28	-	0.35	0.05	0.37	0.37	0.29	0.22	0.28	0.23
3) Moods and emotions	0.23	0.45	-	-0.07	0.31	0.37	0.22	0.12	0.28	0.40
4) Self-perceptions	-0.05	-0.01*	-0.11	-	0.05	0.00*	0.03*	0.07	0.03*	-0.14
5) Autonomy	0.20	0.34	0.30	0.03*	-	0.41	0.22	0.30	0.42	0.28
6) Family relationships	0.23	0.48	0.41	0.02*	0.43	-	0.30	0.17	0.42	0.20
7) School	0.21	0.32	0.23	0.03*	0.24	0.39	-	0.14	0.24	0.10
8) Peers	0.10	0.26	0.19	0.05	0.32	0.29	0.15	-	0.19	0.14
9) Financial	0.21	0.38	0.33	0.01*	0.45	0.20	0.33	0.29	-	0.36
10) Bullying	0.06*	0.26	0.46	-0.11	0.17	0.18	0.15	0.55	0.22	-

Time 1

Time 2

All covariances are significant except for those indicated with \*

**Table 5.8 Fit indices following constraints of estimated pathway coefficients for the invariance of factor loadings over time.**

Model	$\chi^2$	DF	<i>p</i>	IFI	CFI	RMSEA (CI*: .044-.052)	SRMR
Unconstrained	837.68	320	.000	.945	.945	.048 (CI*: .044-.052)	.070
Measurement weights constrained	850.87	330	.000	.945	.944	.047 (CI: .043-.051)	.070
Measurement intercepts constrained	950.73	350	.000	.936	.936	.049 (CI: .045-.053)	.070
Structural weights constrained	956.30	359	.000	.936	.936	.048 (CI: .045-.052)	.070

*p* = significance value for  $\chi^2$ ; \*CI = 90% confidence interval

With reference to the original hypotheses, the statistical analysis of response shift supported the first and third hypotheses that there would be no recalibration or reconceptualisation response shift. However, there was no support for the second hypothesis, as no reprioritisation of domains was detected.

## 5.4 Discussion

The present study set out to assess the extent of response shift as a result of normative developmental processes over the period of one year in a healthy mid-adolescent sample. This was approached through analysing evidence for recalibration, reprioritisation and reconceptualisation response shifts through two approaches: firstly by using a research-design technique incorporating the use of self-reported importance ratings and a thentest, and secondly using the statistical technique of SEM. It was predicted that there would be no age related recalibration or reconceptualisation effect, but that reprioritisation would occur as a reflection of change in adolescents' values and priorities. The hypotheses were partially supported.

The first hypothesis predicted that there would be no systematic recalibration response shift detected at a group level. This was based on the assumption that no meaningful change in cognitive ability or internal standards would take place during this period for healthy adolescents. This was first assessed through conducting a thentest using a sub-sample of individual items from each of the ten QoL domains (Schwartz & Sprangers, 1999). A recalibration response shift was detected in the peer domain, which was rated

more positively at the thentest, indicating that participants retrospectively rated their QoL in this domain as poorer than they had considered it at the time. Recalibration occurred in the opposite direction for the domains of mood and emotions and autonomy, which were rated more negatively at thentest, implying that participants retrospectively rated their mood and emotions and autonomy as better than it had been rated at the time. For the other seven domains the adolescents' internal standards appeared to be similar. The analysis of recalibration response shift through statistical means, however, suggested that there was no effect. This was indicated by the lack of a significant deterioration in model fit when the regression coefficients representing the loading of questionnaire items onto their relevant QoL domains were held constant at times 1 and 2. There is no standard rule to apply in reconciling results obtained using different methodologies, however, as SEM measures change in group means and the *thentest* change within individuals preference may be given to the *thentest* outcomes (Schwartz et al., 1999). Given that the response shift detected through the thentest was in a minority of domains and of small effect size in different directions, the findings may not be entirely inconsistent. Specifically, the results imply that the limited response shift detected by the thentest does not constitute sufficient evidence for a main effect of recalibration of QoL. However, there was a small but significant change in internal standards within these three domains.

It is not unusual to find response shift effects in different directions for different domains, or in only a sub-sample of domains, and this is reported in other response shift studies investigating response shift in adults (Schwartz et al., 2004). The thentest has been criticised for inaccuracy due to recall bias (Norman, 2003). However, it is still a popular method of conducting response shift analysis (Schwartz et al., 2006), and has been shown to provide equivalent results in previous work compared with both an individually-based measures of response shift, and a statistical approach (Visser et al., 2005). With this limitation in mind, a closer look at the three domains in which recalibration response shift was detected in the present sample, would provide some content and face validity to support the findings. Firstly, the domain of autonomy was judged more harshly retrospectively than it was at the time. A possible explanation for this finding may be as a result of the lesser autonomy and choice given to younger children in their home and school lives. If this is consistent with their experience and expectations, research suggests they are comfortable and content operating within these constraints (Stoll et al., 2003). However, one year later, their experience and expectations of personal freedom will usually have increased, reflected by noticeable changes in objective markers such as having greater options to choose school subjects, or greater freedom of where and when to socialise with friends. With this more recent experience, it is very possible that adolescents look back and assume they must have been dissatisfied with the lesser freedom they were afforded in the previous year.

A significant negative recalibration response shift was found for the domain of mood and emotions, indicating that looking back at their QoL the previous year participants re-evaluated their mood to be less positive than they had considered it at the time. There is no particular evidence from previous research to suggest why this shift may have taken place. Indeed, as age is related to poorer self-esteem and an increase in reported daily hassles the reverse would have been expected (Seidman et al., 1994). One possible explanation for this effect may be as a result of the types of question included in this domain. In the Kidscreen instrument, the mood and emotion domain consisted of fairly extreme markers of poor mood, for example “*Have you felt that you do everything badly?*”, “*Have you felt that everything in your life goes wrong?*”, and “*Have you felt lonely?*” The extremity of feeling required to agree strongly with these items is likely to be highly memorable. Thus, the change in ratings interpreted to reflect recalibration may incorporate a large contribution from recall bias, given that memory of extreme moods may be stronger than memory for average mood. Incorporating the assessment of recall bias alongside recalibration response shift for each domain would be useful in assessing this suggestion, and would provide greater confidence in all recalibration response shift findings.

The peer domain was also re-evaluated by participants to be considered more positively in retrospect than it had been at the time. This shift in internal standards is encouraging given previous research indicating that peer relationships become increasingly important for the development and maintenance of positive self-perceptions during adolescence (Craft et al., 2003; Harter, 1990). As such, a shift in standards which makes it more likely that individuals will be satisfied with their peer relationships, has positive implications for self-perceptions. However, without further research, there is little to suggest *why* this response shift may have taken place. Such a shift in internal standards could represent the development of more realistic expectations of peer relationships that comes with increasing maturity. However, its occurrence in the absence of a full effect of deterioration in the peer domain of QoL suggests this is more adaptive than indicative of lowering standards due to increasing difficulty in finding satisfaction from peers. Qualitative work would be useful to explore these suggested and other alternative reasons for recalibration response shift in the three identified domains.

Contrary to the second hypothesis, there was no evidence that the sample had undergone a reprioritisation response shift, either when assessed through self-report, or through the statistical analysis of factor structures. The factor loadings of domains onto the latent variable representing overall QoL were invariant over time, suggesting that the domains remained of similar importance during mid-adolescence. The most important domains in



contributing towards QoL at both time points were peers, family relationships and autonomy, and the domains rated least important were finances and school. It should be noted, however, that in absolute terms there was very little difference detected between domains from the self-report instrument used. On a five point scale the range of responses spanned only from 3.46 to 4.23 at time 1, and 3.60 to 4.46 at time 2. This represents variation of less than a single unit on a scale where a score of 3 related to the label *moderately important*, and 4, to *very important*. Previous work using other QoL measures however shows a similar stability in the importance of domains. For example Petitt and Cummins (2000) presented self-reported ratings of the subjective domains of the ComQoL instrument (Cummins 1997) for adolescents in school years 7, 9 and 11 (age range 11 to 17). Much as in the present study, there was little change in the relative importance or satisfaction of domains; the three domains rated most important, and three rated least important remained constant.

The lack of reprioritisation response shift was a surprising finding given the large body of adolescent development literature which suggests that considerable changes do occur during adolescence in many areas related to QoL, such as the importance of family and peer relationships (Bukowski & Sandberg, 1999), physical self perceptions (Craft et al., 2003; Robbins et al., 2004a) and goals (DiClemente, 1996). However, although no support was found for response shift, the findings are not necessarily inconsistent with the changes suggested to be taking place. QoL is defined as a construct that varies as a function of a person's values and expectations (WHOQOL, 1995b). As such, good QoL can potentially be achieved regardless of whether expectations are high or low, as long as these can realistically be met. This is demonstrated by the consistently high reports of QoL across cultures, regardless of large differences in the indices often used to provide objective measures of QoL such as income, housing conditions and education (Diener & Diener, 1995). Thus, rather than bringing about a reprioritisation of the constituents of QoL, the changes in priorities and values that are documented to take place during adolescence may instead lead to a change in the way each domain is satisfied. For example, the peer domain may be important to both children and adolescents, but whereas having a nominated "best" friend, and seeing friends occasionally after school may be sufficient to satisfy a child's peer related QoL, in adolescence, the same rating may only be achieved through spending extended periods of time in the company of a group of friends, and developing much more intimate relationships. In either case, the domain could remain of equal importance, and be equally readily satisfied within UK society, but this would be achieved through different behaviours.

The final hypothesis that there would be no reconceptualisation of QoL for this healthy adolescent sample was supported. In studies comparing QoL of healthy versus clinical

adult populations, it is assumed that in usual conditions the conceptualisation of QoL in adulthood does not change (Schwartz & Sprangers, 2000). The present study provides support for this assumption with a sample of healthy adolescents.

#### **5.4.1 Limitations**

There are several limitations to the longitudinal study of QoL, and the application of the theory of response shift. First, and as previously discussed, there is a risk of inaccurate or biased recall effects influencing the test results. The one year period between the initial measurement and retrospective *thentest* in the present study was considerable, however, by the age of 15 adolescents are considered to have similar cognitive capacities to adults (Commons et al., 1984) with whom acceptable, if imperfect, reliability of the *thentest* has been established (e.g., Visser et al., 2005). Indeed a greater number of cues to memory may be available for individuals in a school situation than are available for adults, but future work would be useful in assessing the reliability of the *thentest* in a younger age group. The consistency of statistical and *thentest* findings in the present study contributes to this evidence base. However, a similar procedure to that described by Sprangers et al. (1999) in section 5.1.1.1 to partition differences between current and retrospective judgements in adolescents experiencing recalibration shifts (e.g., clinical populations) would provide a useful assessment of the extent of recall bias in this age group.

A further limitation of the present study was the restricted age group. Contrary to expectations suggested by an extensive adolescent literature, no reprioritisation of QoL domains was detected. While this may indeed represent the true effect, as is assumed in the discussion section, the restricted age range of the sample means that these findings cannot be generalised beyond the present age group. The present sample was aged between 14 and 15 years of age, whereas the triggers associated with changes in priorities and aims are considered to result from the biological changes occurring at puberty, which is estimated to occur approximately by the age of 13 for girls, and 15 for boys (Graber et al., 1996b). Therefore, although it was expected that some adjustments would still be ongoing at the age of 14 in both sexes, it cannot be ruled out that considerable reprioritisation of QoL domains may have begun much earlier and stabilised by this time. For example, the self-perception domain, which loaded only very weakly onto the overall latent factor of QoL at this age could reflect a previous reprioritisation or reconceptualisation response shift, but without further extending the age range of participants this cannot be assessed. Alternatively, in the most conservative terms, these findings may reflect a very slow speed of change, rather than stability. Thus, while the present study provides a much needed example of the assessment of response shift in adolescents, research across a wider age group is called for.

Finally, the present study relied on assessing change in QoL through quantitative methods. Qualitative techniques for assessing response shift in individuals would have provided additional support for the validity of the findings, not only in providing alternative means of testing the main effects, but also of exploring why changes in standards or values do or do not bring about an effect.

## **5.5 Conclusions**

The results of the present study showed that there was very little change in the way QoL is conceptualised and measured by adolescents as a result of the normative developmental changes they experience. Within the restrictions of the characteristics of this sample there was no evidence of reprioritisation or reconceptualisation response shift suggesting that the factors constituting QoL remain constant. While there was no evidence of extensive recalibration of the internal standards by which QoL is measured, the adolescents in the present sample reported a small recalibration response shift in three domains of their QoL; mood and emotion, peers, and autonomy. When the adjusted *thentest* scores are compared with post-test ratings one year later, a deterioration in QoL was found for the present sample in the domains of physical health, and self perceptions, consistent with other research reporting a deterioration of QoL with increasing age during adolescence (Bisegger et al., 2005; Drukker et al., 2006). It was encouraging to note an improvement in the domain of bullying. Future work is warranted to explore normative QoL changes in other age groups, and thus to further assess whether the assumption that QoL is a stable construct during adolescent development is upheld. Such work would be essential in establishing a baseline of the normative pattern of change or stability of QoL, against which to better interpret the findings of studies involving clinical populations, and to evaluate intervention research.

Following on from this analysis of response shift, the next study aims to return to a further investigation stemming from issues raised in study 2 (Chapter 4). The results to the quantitative analyses reported no overall change in LTE or QoL, however, it was clear that when the results were broken down that change was occurring at an individual level. Such questionnaire-based quantitative research designs have only a limited ability to explore the changes that may be going on within individuals, and the reasons why anomalous results, such as the positive findings for introjected regulation may have come about. Therefore, study 3 set out to take a qualitative approach to further exploring the goals and motives adolescents have for exercise, and in particular their own reasoning behind exercising for introjected regulation.



### **An Idiographic Analysis of Adolescents Showing Introjected Regulation Towards Exercise**

Chapter 4 tested a model of the effects of negative weight-related physical self-perceptions on the outcomes of leisure time exercise (LTE) and quality of life (QoL), mediated through need satisfaction and motivation. Both need satisfaction and the degree of self-determined motivation were found to be important in mediating the relationship between weight-related physical self-perceptions, LTE and QoL. The purpose of conducting such observational studies was to gain a better insight into the factors that are important in influencing adolescents' exercise motivation and behaviour, in order to apply these findings to a behaviour change programme. Implicit in the investigation was an assessment of the factors which may promote or deter the process of internalization (i.e., promote or inhibit the development of identified motivation). In previous chapters, identified regulation was considered indicative of internalization and in line with SDT was associated with lower levels of weight-related physical self-perceptions and higher levels of need satisfaction (Ryan & Deci, 2002). However, contrary to expectations, introjected regulation was also found to be adaptive in promoting LTE. Drop-out from LTE over a period of one year was associated with a decrease in the level of introjected regulation, whereas maintenance and uptake of greater LTE were associated with higher levels of introjected regulation. Similarly, although SDT suggests that acting out of introjected regulation is associated with poorer well-being (Ryan & Deci, 2000b), in the longitudinal results reported in this thesis introjected regulation was not associated with poorer QoL.

Such quantitative research provides a good overall view of adolescents' likely responses to similar environments, but does not permit an exploration of the experience of these effects at an individual level. In the light of the unexpectedly positive findings for introjected regulation in the longitudinal sample of adolescents, and in recognition of its importance in the process of internalizing health behaviours over the long-term, the present study aims to explore the experience of introjected regulation towards exercise at an individual level.

## 6.1 Introduction

The decline of physical activity from childhood through to adulthood is well documented (e.g., Caspersen et al., 2000; Janz et al., 2000), however, less is known about the process through which individuals consciously or otherwise move towards these more adult-like behaviour patterns. A logical place to start is in examining adolescents' reasons or motives for different types of exercise. As exercise becomes a function of more than just the childhood desire to have fun, individual differences become increasingly important in determining which adolescents will remain active, and which begin to drop out. Previous literature suggests this will be influenced by a range of factors such as their immediate friendship group, the wider peer group (Smith, 2003), self-perceptions (Smith, 1999; Neumark-Sztainer et al., 2003a), and the interactions between all of these factors (Faith et al., 2002).

Introjected motivation is of particular interest for the study of behaviour change, as it is considered to represent the first step in the adaptive process of the internalization of behaviour (Deci et al., 1994; Vansteenkiste et al., 2005b). While it is generally accepted that greater exercise persistence would result from more self-determined forms of motivation than introjected regulations, it is acknowledged that much learned behaviour must inevitably start in response to external prompts (Ryan & Deci, 2002). Without external factors driving the early stages of behaviour change, an individual would not gather sufficient experience to become competent and familiar with the new behaviour. Although the importance of introjected regulation as a starting point for the adoption of uninteresting, or societally prescribed behaviour has been identified, it has not been well studied. Previous qualitative research investigating motivational regulations in adolescence has provided more detailed analysis of the experience of amotivation (i.e., the absence of motivation to act; Ntoumanis et al., 2004), intrinsic motivation (Hassandra et al., 2003), or of identified regulation which represents the end point of the process of internalization (e.g., Vansteenkiste et al., 2004a). However, the need to recognise and better understand the processes at play at the outset of the internalization of behaviour is increasingly acknowledged (e.g., Vansteenkiste et al., 2005b). This is particularly pertinent for the present thesis following the findings in study 2 of the association of introjected regulation with positive affective and behavioural outcomes, contrary to previous research findings.

Given the pivotal role that introjected regulation could play in bringing about positive behavioural change, and the lack of previous work in this area, this study aimed to explore the reasons why adolescents may exercise from introjected regulations, and how they relate to their other motives for taking part. It was expected that introjected regulation

could represent both a point of transition in the process of internalization in some students, and in others an end-point for motivation in students who do not manage to integrate exercise with their core values (Deci et al., 1994). Thus, variation in the basis for introjected regulation between individuals was expected. To fully explore the intra-individual factors underpinning motivation, the research was conducted using the qualitative approach of interpretative phenomenological analysis (IPA).

IPA is a method of analysis by which to investigate the process that individuals use to make sense of their world (Smith & Osborn, 2003). It is based on the premise that researchers are not seeking a single fact or an ultimate truth, but instead are seeking to investigate the meaning that particular events or situations hold for different people. IPA typically involves only a small number of cases, as it is not so much concerned with generalisations, but the detail of perceptions and understanding at an individual level. Thus, it is particularly suited for research investigating the basis of motivation as set out by SDT, which is characterised by individuals' subjective perceptions of their environment, rather than objective attributes which are open to direct observation (Ryan & Deci, 2002). This approach was selected to provide greater insight into the reasoning behind motivational regulations than that provided by the majority of adolescent research based within SDT, which employs the use of questionnaires (e.g., Sheldon & Bettencourt, 2002; Ntoumanis, 2005; Standage et al., 2006). IPA facilitates the investigation of a process, allowing exploration of how the individual interacts with their environment to arrive at a given outcome, and how the individual constructs their own theory of how this has come to be. The researcher plays an active role in attempting to elicit not just a person's immediate responses to a set of questions, but to enlarge on these to explore their full account. It is acknowledged that the findings are as a result of an interpretive process on the part of the researcher. IPA is commonly applied to the exploration of broad research questions that are concerned with meaning making, which may be very different for different individuals (Smith & Osborn, 2003). The question assessed in the present study was; "*what reasons and goals for sport and exercise underpin introjected regulation in adolescents?*"

Such a phenomenological approach has been used to good effect in previous work with adolescents to obtain in-depth descriptions of their experiences (e.g, Ntoumanis et al., 2004; Kinavey, 2006; Peterson et al., 2007). For example, Petersen et al. (2007) conducted semi-structured interviews with 14 adolescent mothers (aged 16 to 19 years) to explore their experience of inpatient postpartum care, recruiting new interviewees through purposive sampling until the point of data saturation. The process extracted examples of nursing behaviours that were associated with good satisfaction, and those associated with poor satisfaction, which were considered useful for informing future patient care. In a

study exploring how adolescents make sense of growing up with a chronic illness, Kinavey et al. (2006) reported on interviews with 11 late-adolescents with Spina Bifida. Themes were first extracted by analysing the narratives of adolescents on a case by case basis to detect processes within individuals, which were then organised into higher order themes through cross-case analysis. From this extensive process, three very different approaches to constructing a self-identity were described, each of them common to a number of adolescents. The results contributed to better understanding on the construction of positive disability identities. In a sport and exercise setting, Ntoumanis et al. (2004) interviewed 21 adolescents to explore the factors behind amotivation (the lack of engagement) in school PE, which extracted three explanatory themes with a view to informing policy and future interventions. These were learned helplessness beliefs, low need satisfaction, and contextual factors such as teaching style. Studies such as these provide support for the suitability of IPA in exploring the development of motivation for taking part in sport and exercise.

A better understanding of motivation for exercise in adolescence is important for designing child centred interventions, policies, and curricula that take an evidence based approach to determining factors important to exercise behaviour at this life stage. Adolescents may well be sufficiently physically active for health during their school years through controlling means (i.e., greater amounts of mandatory PE, or parental control out of school), but once these controls are removed they would be unlikely to maintain these exercise levels into adulthood unless the motivation to do so has been internalised to some degree (Deci & Ryan, 1985b; 1991). Therefore, it is as much the quality of motivation as the quantity of exercise that is important during adolescence. As such, exploring the factors that lead individuals to begin the process of internalization, and the factors which indicate why many fail to integrate their motivation beyond the level of introjection could provide useful information for the development of future interventions grounded in SDT.

## **6.2 Method**

### **6.2.1 Participant Recruitment**

Participants were Year 9 students recruited from two large coeducational secondary schools in the South West of England (mean age=14.24; SD=.30). Both schools served towns in rural areas, and had low numbers (<2%) of students from ethnic minorities. School A served students with slightly below average socio-economic status (indicated by a high entitlement to free school meals), and School B served students with slightly above average socio-economic status. Ethical approval was granted from the local Research Ethics Committee, and written consent was provided by Head Teachers of each school



acting in loco parentis in line with British Psychological Society Guidelines (2000). Letters were also sent home to parents of all students who were invited for an interview, informing them of the study and seeking parental consent.

The study was explained to all students in the year group, emphasising that the research was optional and that their responses would remain confidential. In order to identify students exhibiting high levels of introjected regulation for interview, all students in the year group were asked to complete a brief questionnaire assessing their motivation towards exercise (BREQ-2; Markland & Tobin, 2004). The motivational questionnaire (BREQ-2) consisted of 19 items relating to the five types of regulation identified by SDT (i.e., amotivation, external regulation, introjected regulation, identified regulation, and intrinsic motivation). Responses were recorded on a five point Likert-type scale anchored from 0 (*not true for me*) to 4 (*very true for me*). The completion time was approximately five minutes. Adequate factorial validity and reliability has been previously reported for this measure in an adolescent sample (Gillison & Standage, 2005). On the final page of the questionnaire students were asked to indicate whether or not they would be happy to be approached for an interview.

A total of 279 students completed the initial questionnaires, 65% of whom consented to be approached for interview. The selection criteria for interview were (a) students reporting the highest 15% of scores for introjected regulation according to the BREQ-2 (47 students), and (b) providing personal and parental consent for interview. All eligible interviewees were invited to take part, and the final sample determined through practical issues, such as willingness to be interviewed, prompt receipt of parental consent, and presence in school on the day of data collection. IPA studies typically include only 6-10 participants (Smith & Osborn, 2003). As differences between girls and boys at this age were expected with regard to the expression of introjected regulation, the study aimed to include 6-10 interviews for each gender. Thus number was achieved through the participant selection criteria described.

The final sample comprised 18 students (mean age=14.39; SD=.22); 8 girls, and 10 boys (7 from School A, and 11 from School B). One third of those eligible for interview in the first school approached declined to be interviewed ( $N=9$ ) or failed to return parental permission slips ( $N=2$ ), which necessitated the recruitment of the remaining participants from a second school (refusal rate of 3 of 17; 18%). All interviewees but one were white and British, and all spoke English as a first language. There were no differences in the motivational regulations between the individuals interviewed, and those invited for interview but who did not take part (see Table 6.1). Due to the small numbers involved,

mean scores were compared using non-parametric (Mann-Whitney) tests. In line with the conditions of ethical approval, no reasons for refusal were requested.

Non-parametric Mann-Whitney tests were also conducted to examine the differences in motivational regulation between the interview sample and the entire remaining year group. This was in order to gain a clearer picture of the type of students interviewed in relation to their peers, and to aid the interpretation of results. Effect sizes for the meaningfulness of the differences were computed using Hedges  $g$  statistic, which controls for unequal samples sizes (Hedges, 1981). As expected, there were significant differences in the level of introjected motivation between the two groups (large effect size;  $g = 2.03$ ), however, the interview group also reported significantly greater intrinsic, identified and external forms of motivational regulation (see Table 6.2 and Figure 6.1). These differences were of moderate effect size for intrinsic regulation ( $g = .55$ ), and large effect size for identified and external regulations ( $g = .84$  and  $g = .78$ , respectively). The interview sample also scored lower on amotivation than the total sample, although this did not reach significance (small effect size; hedges  $g = -.26$ ). Thus, compared with the whole school sample, the interview participants were higher in all forms of self-determined motivational regulation, but also significantly higher in external regulation.

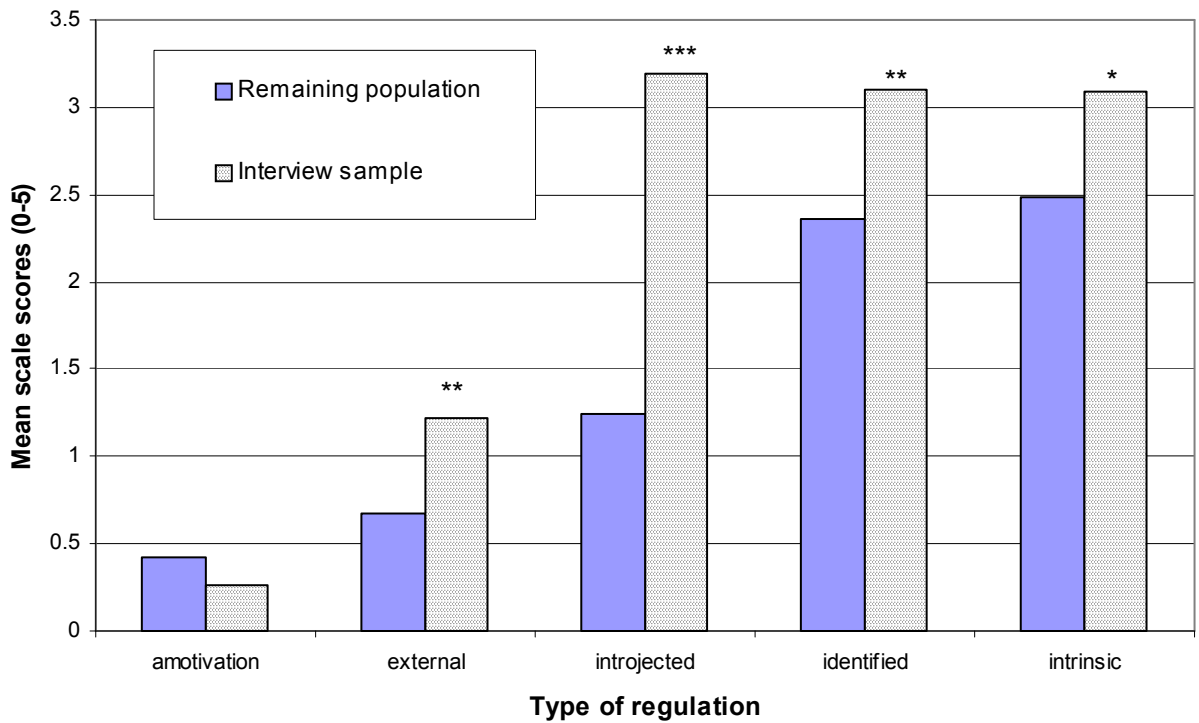
**Table 6.1 Differences in motivational regulations between participants eligible to be interviewed accepting or declining to take part**

Motivational regulation	Interview sample	Eligible but declined	U value	Z score
	Mean (SD), N=18	Mean (SD), N=29		
Amotivation	.26 (.56)	.26 (.68)	245.50	-.03 (NS)
External regulation	1.18 (.76)	.87 (.85)	184.50	-1.42 (NS)
Introjected regulation	3.23 (.39)	3.13 (.49)	201.50	-1.05 (NS)
Identified regulation	3.10 (.68)	3.01 (.87)	239.00	-.17 (NS)
Intrinsic regulation	3.16 (1.03)	2.97 (.93)	199.00	-1.10 (NS)

Note: NS>.05

All participants were asked at the outset what sport or exercise they took part in during a 'normal week'. Thirteen out of the 18 participants (eight boys (80%) and five girls (63%)) took part in organised sporting activities outside school; rugby club (4), football club (4), hockey club (1), swimming club (1), gymnastics (1), dance classes (2). All 10 boys were involved in regular *informal* exercise outside school; playing football with friends (10),

**Figure 6.1 Differences in motivational regulation between interview sample, and remaining year group pupils**



Note: \* p<.05, \*\*p<.01, \*\*\*p<.001

**Table 6.2 Comparison of motivational regulation of interview sample, and whole school sample.**

	Remaining students (excluding interview sample, N=261)		Interview Sample (N=18)		Mann-Whitney U statistic	Effect Size (Hedges g)
	Mean (SD)	Range	Mean (SD)	Range		
Amotivation	.43 (.69)	0 - 4	.25 (.54)	0 - 2	1942.50 NS	-.26 (small)
External regulation	.67 (.71)	0 - 3.75	1.22 (.78)	0 - 2.27	1378.50 p<.01	.78 (large)
Introjected regulation	1.24 (.98)	0 - 4	3.18 (.43)	2.33 - 4	241.00 p<.001	2.03 (large)
Identified regulation	2.36 (.89)	0 - 4	3.10 (.66)	1.75 - 4	1220.50 p<.01	.84 (large)
Intrinsic regulation	2.49 (1.11)	0 - 4	3.10 (1.04)	1 - 4	1527.50 p<.05	.55 (medium)

attending a gym (3), jogging (4), home weights/toning (2), and family activities (1). Only four girls reported informal exercise outside school; horse riding (1), jogging (1), home weights/toning (1) and family activities (2). From self-reported frequency of exercise<sup>9</sup>, all except one (female) participant appeared sufficiently active for health, in accordance with age-matched Government guidelines (Department of Health [DoH], 2004a).

### **6.2.2 Procedure**

All interviews were conducted by the same researcher, and took place in an empty room at the student's school, one week or more after the completion of the screening questionnaires. Interviews lasted approximately 15 minutes. The criteria of selection were not communicated to the school in order to retain participant confidentiality. Participants were reminded at the outset of the interview that they did not have to take part and could withdraw at any time, and it was verified that they were happy for the session to be tape-recorded. Written consent was obtained from participants at this stage.

Participants were then shown their previous responses to the BREQ-2 questionnaire, and asked whether they still agreed with their previous responses. The interviewer then provided a working definition for what was intended by "sport and exercise" for the purposes of the interview, by asking participants to think about "*the sorts of physical activity you take for the sake of the "exercise" itself. So this would include any sports you do, it would include things like walking in your spare time out of choice, and would include things you do for fun with friends or family, such as skateboarding, playing football or cycling. All it doesn't include are times when your are physically active almost by accident, so things like getting into a sweat when doing housework, or walking to places because you have no other option, rather than because you choose to.*" Participants were then asked if there were any activities they regularly undertook that they were unsure about, and any queries were clarified.

### **6.2.3 Development of Interview Schedule**

The purpose of the interview was to extract participants' accounts of why they take part in sport and exercise, and in particular why their motivation is often introjected (i.e., undertaken as they would feel guilty if they did not). The interview schedule consisted of four sections (for full schedule see Appendix 6.1), starting with more general questions relating to the adolescent's usual reasons for activity, leaving the more specific theory-

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<sup>9</sup> This was considered as a rough guide sufficient for the purposes of this study, as it is acknowledged that self-reports commonly overestimate activity levels

based questions to the end of the interview to avoid biasing participants towards these factors earlier on (Gillham, 2000). A semi-structured approach was taken in order to allow new concepts to surface, and to allow the interviewer to follow areas of interest raised by participants that were outside the interview schedule, but relevant to the research question.

Participants were first provided with an opportunity to describe what exercise they usually took part in, and their reasons for taking part in their own words. They were asked to think about whether there were differences in their reasons, goals or enjoyment for different types of exercise, or in different settings. They were then asked to consider whether any of these factors had changed since they started at secondary school, and if so in what ways. Following this, they were asked a number of theory-based questions relating to the psychosocial mediators of motivation as set out by SDT. Firstly, they were asked about their experience of each of the three basic psychological needs in exercise settings. The need for competence was explored through asking whether or not they felt 'good at' the sport and exercise they did, and what information this was based on (i.e., self-referenced comparisons, feedback from others). Autonomy was explored by asking whether they felt themselves 'to be the one who decides' how much sport and exercise they do, and by asking who initially introduced them to any activities they do outside school, and if there was anyone they would feel that they were letting down if they stopped. Relatedness was assessed through asking for students' perceptions of the attitude towards people who take part in sport and exercise held firstly by their close friends, and secondly by the wider body of students in the school. Finally, participants were referred back to the questionnaire and asked directly what lay behind their answers that they would *feel guilty* if they skipped an exercise session, or why they considered exercise was something they *should* do.

#### **6.2.4 Analysis**

All interviews were recorded using a Dictaphone, and transcribed verbatim. Transcripts were analysed using Atlas.ti (version 7.0, Scientific Software), which assists in the coding of lower and higher order themes, and exploring relationships within these. The use of computer-assisted data analysis reduces the time needed for analysis, reduces inter-rater errors, and makes procedures more systematic (Tesch, 1989). Ensuring the reliability and validity of findings (often termed dependability, trustworthiness and rigor in qualitative research) is just as important to qualitative as to quantitative research (Golafshani, 2003). One method to improve the reliability and validity of analysis in qualitative research design is through investigator triangulation. This refers to the process of drawing on more than one investigator's interpretation of qualitative data, to arrive at a better understanding of the constructions of participants, and to increase the trustworthiness of interpretations by

exposing the extrapolations made by individual investigators to greater scrutiny (Golafshani, 2003). Researcher triangulation was used in the present analysis, and sources of information were also triangulated, by combining questionnaire data with interview data and interviewer notes relating to the tenor of the interview, as has been conducted to strengthen trustworthiness in similar previous research (Hassandra et al., 2003).

Data were then analysed following recommendations by Smith and Osborn (2003). In line with these recommendations the transcripts were reviewed several times by two researchers (the interviewer, and a second coder), until both became familiar with the accounts. The researchers then independently identified the key phrases or content of the interviews that they considered to contribute to each interviewee's reasons for exercise, coding these into preliminary low level themes. For example, reasons for exercise were coded into categories such as; for fun, for fitness, and for spending time with friends. The two researchers then conferred to compare items extracted for coding and the themes to which they were allocated, and to agree on a range of common emergent themes (investigator triangulation). Statements that lead to a divergence of opinion were discussed. However, the aim was not to arrive at a final unanimous interpretation of the interviews but to open a discussion of alternative interpretations and to ensure that each interpretation retained in the results was backed up by meaningful units from within the interview text (i.e., a phrase, sentence or paragraph identified relating to represent a single concept or theme). Thus, in line with the IPA approach, two alternative codes were allowed to co-exist if both researchers agreed that each was supported (Smith & Osborn, 2003). Once preliminary themes had been agreed, the researchers returned to the transcripts to complete the coding in line with the agreed themes, identifying occasions where new themes were required as necessary. No theoretical constraints were placed on the coding at any of the data extraction stages (i.e., the SDT framework and/or terminology was not imposed). Key phrases were coded into themes as repeated concepts emerged, and labelled using data driven, as opposed to theory driven, nomenclature.

Following coding, the interviewer constructed profiles for each participant. These drew on the key meaning units extracted for each participant, and contextual data relating to the experience of the interviews themselves (e.g., the participants attitude, level of engagement, and cooperativeness) to assist in clarifying relationships between themes within each individual. The final profiles are presented in appendix 6.2. These profiles were then checked by the second researcher for consistency with the evidence presented in the interview transcripts. The researchers then worked co-operatively to consolidate the initial raw themes into better defined specific and general categories (Brizuela, 2000;

Patton, 2002). The participant profiles were used as a check to ensure that the final themes and the proposed relationships between them were a representative account both within and across participants. In keeping with the IPA approach, the results are presented as the themes as they emerged from the interviews. Interpretation of the themes in relation to the tenets of SDT is restricted to the discussion section.

### **6.3 Thematic Analysis**

The reasons given for taking part in sport and exercise were fairly consistent across participants. They included enjoyment, health and fitness, weight control, appearance, and socialising. However, within the discussions from which these reasons were elicited, three broad themes stood out as having particular interest for answering the research question, and for future applications of these findings. These were (1) the effect of gender on the social environment in which exercise takes place, (2) the goals that students have in mind when exercising for fitness (i.e., fitness may be the immediate aim, but why do they want to be fit?), and (3) the difference between factors that promote maintenance of the behaviour through encouraging positive participation, and those that promote maintenance through deterring quitting.

#### **6.3.1 Theme 1: Gender differences in the social exercise environment**

There was no apparent gender difference in the propensity for enjoyment of exercise within this sample, as all participants reported enjoying exercise. In response to the direct question of why they took part in sport and exercise, the participants invariably presented enjoyment as either *the* primary reason, or one of two major reasons for doing so. Similarly, there was no evident gender difference in the proportion of girls or boys taking sufficient exercise for health, as all but one (female) participant reported high levels of participation in exercise during their leisure time. However, gender differences did emerge in the social settings in which leisure-time exercise took place.

##### *Informal exercise*

All the boys in this sample reported that they exercised informally with friends on a regular, usually daily basis;

M11 ...me and one of my friends stay after school a few days a week and play tennis and do high jump and stuff, cause it's good fun, but we don't, yeah after school as well, like after that we go and play football, a lot of people, it's quite good fun.

M7 Yeah, like I go over my friends, like most nights - my best mate, and he lives quite far away so I go to his all the time, and we're never like stuck indoors. Like the only time we're stuck indoors is if we're, just probably going to sleep or somet.

Even for those who took part in additional organised sports or fitness training on their own, for much of the time they spent with friends, they were engaged in physically active pursuits. A number of boys gave the impression that they had little option but to take part in physical activities if they wanted to spend time with their existing friends.

M7 If like my friend's doing somet and I don't want to do it, I'd like play with them, I always say "are you going to do that" and if they say "yeah", I'll do it the same with them... If my friends aren't playing it I'll be like "no", or someone I don't like or somet like that, I won't do it.

M17 Yeah cause if they're all playing football, and I'm doing something else, then I'm probably going to join in aren't I?

It was a repeating theme that friends were very important in determining adolescent boys' exercise levels. The comments above show how they may be encouraged or even pressured at times to take part when they would ideally choose not to, but it was also apparent that the boys recognised the value of friends in increasing their enjoyment of physical activity.

M18 I prefer to do in school, 'cause then it's with my mates. It's more fun to do sports with mates than on your own really.

M5 I wouldn't do a lot if there wasn't someone with me to do it with.

M11 Um,.... like I wasn't too fond of football, but they needed another player, so I joined the team, and it's good now, 'cause um, I've made more mates, well I've made mates that I wasn't particularly fond of before. Like now that I know them better, like my first impressions of them weren't great, but now I'm playing it's just, you know, a bit social.

Hence, boys showed considerable uniformity in enjoying sport, preferring to take part with their friends, and in being prepared to take part as a means of social interaction even when they would have preferred not to. Additionally, the boys' quotes suggest that they recognise that sport provides opportunities to make friends.

In contrast to this, none of the girls reported taking any informal regular physical activity with friends, although one girl did report daily informal exercise after school at home with



her siblings. This was despite girls recognising, just as boys did, that they preferred exercising with friends:

F3 I normally take part because it's things I like doing. I like um, joining in and messing about and playing with um, friends. So it's just another way of interacting with other people.

F9 I'm quite keen to do it [exercise] in school, where I know my surroundings, what I'm doing, 'cause I don't like to do it with strangers, I like to do it with people which I know.

F8 Um, sometimes if there's a club that nobody wants to join, I might join it, but I might not, 'cause, like, I always like there to be someone there that I know, and that I can enjoy it with.

The majority of the girls in this sample were active outside school, whether through joining clubs, or exercising for fitness on their own. However, despite playing on school teams together with friends, and enjoying exercising with them in PE, they made no attempts to involve their existing friends with their activities outside school. There appeared to be a barrier to girls approaching their friends to take part in exercise together. This is perhaps most clearly demonstrated by differences in how boys and girls go about getting involved in clubs outside school. Girls were usually introduced to out of school clubs by their parents:

F13 Well, I used to do swimming ages ago [before I moved to this town], and I actually thought I was quite good at it, and then my dad came home and said there was a swimming club [here] and I said yeah I'd like to join that.

F18 I wanted to do it [horse riding], but she [my mum] was the one that got me into because she had a horse when I was little.

F9 ... 'cause I do ballet, tap and modern, and my mum [got me into it] ... I started when I was 2, and I've been dancing to Disney Land this year, so mostly my mum [got me into it].

Until asked directly, the girls rarely credited their parents with providing them with any encouragement or assistance in taking up sport and/or exercise. Yet for each of these examples, it is implicit that instrumental support from parents was essential, whether in driving to and from classes, providing financial backing, or identifying opportunities for sport and exercise. In some cases such parental involvement started very early in life (e.g., at the age of two), suggesting the major impetus of initiating involvement in the activity was parental. In contrast to the girls, boys reported more commonly getting involved in sport outside school through joining clubs along with their existing friends:

M2 Well when we first started school here, all my friends ..started playing rugby, and we got really into it and, um, we got a letter from [the] rugby club to say we need players, so we all went down.

M10 Well I when I was about Year 4, one of my friends, he played for the club and they do like fun days in half term, and he invited me to go to the fun day with him. And while I was at the fun day I met the guy who would have been my coach if I joined, and I thought I might as well do this for a bit; I did it and I enjoyed it so I carried on.

There was some evidence that girls' lack of involvement with their friends in leisure time exercise extended to the degree that they rarely even spoke about their sporting or exercise life outside school to one another. Two comments made by different girls, both of whom were involved in committed frequent exercise after school, support this. When asked whether her friends are physically active themselves, one participant replied;

F13 Yeah, they do all the PE at school. And I don't know what they do after school.

This revealed that she was unaware whether her friends got involved in exercise after school, or what they did, implying that this was not a point commonly discussed. The second participant went further to imply that when she was away from school, she was released from the confines of complying with expectations from the peer group, and was only then able to exercise as she pleased.

F17 Like in school it [what my friends think] does [affect how much I do], but like out of school they're not there, so I'm just in complete control of it, but in school, if they don't do it then I don't wanna do it.

A further example was given by a participant who described herself as "enthusiastic, but not particularly skilled". She reported having highly active friends, yet regretted that they did not do more exercise together:

F14 Well one of my best friends is very sporty, and she does it all the time. A few of my friends that I hang out with most of the time are keen swimmers, and I don't swim at all, so... So when we're together we don't [exercise together]... I feel sometimes a little bit left out, because I can't be as good, or do how much they do.

The exercise that this girl undertakes instead is very solitary, in the form of jogging on her own, and carrying out the muscle toning exercises suggested by girls' magazines. However, despite the apparent reluctance of girls to talk to each other about the exercise they take part in outside school, or attempts to involve each other in exercise as a way of

socialising as the boys did, all eight female participants reported that being “sporty” was very positively perceived by their peers.

F13 Um, they [my close friends] think it's a good thing if you do like doing it [exercise], but people that don't do it, um they should try and do a bit more.

F8 Yeah probably, things like sports day, people look up to you and say well done you did really well and stuff. Yeah.

F3: Yeah, if you like do things well in a lesson on sports days and things you get immediately thought of, like I'm doing the 200m and the high jump.

Although it was not always stated, these comments implied that being selected for teams or to take part in events at sports day, was a prestigious achievement. The interview sample were not completely representative of all students so these perceptions may not be shared across the whole peer group, but even so, these responses provide little clue as to why girls are so reluctant to encourage their friends to exercise with them after school; they all enjoy exercise, they enjoy it more when taking part with friends, and expend considerable effort in seeking opportunities for sport or exercise outside school.

In summary, the participants' responses revealed a large difference in the social environments in which boys and girls exercise. For boys, the peer group was very strongly supportive of physical activity, sometimes to the point of being pressurising, and informal sport or exercise was a common daily pursuit. Sports and active play filled a major part of the time that the boys in this sample spent socialising with each other. They showed considerable sensitivity to who was playing alongside them, acceptance that taking part in sport and exercise was the basis for their social life, and that choosing not to take part would effectively mean choosing not to spend time with their existing friends. The social culture for girls contrasted starkly with this. While sporting competence was generally perceived positively, taking part in physical activity was very much a hidden pastime. Despite similarities with boys in reported enjoyment and a preference to exercise with friends, leisure time exercise for girls largely took place separately from their school friends in formal, organised settings, such as clubs. Girls were thus more inclined to make new social contacts among other girls who had independently made the same choice, rather than to attempt to interest their existing friends in joining them.

### **6.3.2 Theme 2: Reasons versus goals for exercise**

This adolescent sample largely recognised that they undertook different forms of exercise for different reasons. Predominantly, sport was undertaken for fun, whereas other forms of exercise were undertaken for health, fitness, or to maintain/improve body shape.

Similar themes emerged for both genders, so the findings will be presented together. Consistent with the literature relating to body dissatisfaction (Wang et al., 2006), boys were as likely to mention exercising to build muscle as they were to mention exercising as a means to lose weight, although this aim was not an exclusively male goal; two girls were also concerned with exercising for muscle tone. Sport was differentiated from exercise by participants and was commonly a social activity for both sexes which adolescents preferred to engage in with friends.

Participants were aware of the importance of regular exercise for health and fitness in school, however, the degree to which this information was personally endorsed varied considerably. While some students relayed this information as something they had been told, others presented it as their own conviction, believing it to be as applicable to themselves as to others. Very early in the interview, all but one participant mentioned health and fitness as a reason for exercising, however there were striking differences between participants relating to *why* they wanted to be fit or healthy, relating to their ultimate aims or goals of taking part in exercise. Two distinct groups emerged from the sample; firstly those who wanted to achieve fitness for sport performance, and secondly those who wanted to achieve fitness for self-improvement. The two groups are discussed in detail below.

### *Fitness for sport*

The first group, comprising six boys and two girls primarily wanted to attain fitness as a means to maintaining or improving their performance at a preferred sport. In this case fitness fulfilled the function of enabling them to take part in activities that they were engaged in for more intrinsic reasons.

M12 I wanna be in the best fitness I can for my football and everything, um just staying in shape.

F17 I do horse riding because like I enjoy it, 'cause like that's what I've always wanted to do, and I do dance to keep up the muscles in my legs for horse riding.

Participants in this group recognised the training benefits of exercise, and were prepared to invest time and energy improving their success in sport through engaging in secondary forms of exercise. As the predominant reason for playing sport was for fun, this group were primarily investing their time in order to maintain their ability to participate in something they enjoyed. Fitness was therefore important, but only for a very circumscribed part of their lives. The responses of this group implied that they considered health to be a by-product of the exercise that they primarily undertook for fun, and there

was little in their comments to suggest that without their sport as an ultimate aim they would be particularly concerned with staying fit. This suggestion was summed up eloquently by one boy:

M4 But it's generally people enjoy it [exercise], and they don't *mind* the fact that they're like going to become, to keep, healthy. I don't think keeping healthy is the main reason they start doing it. They like doing PE, but it's [just] one of the reasons they might enjoy it.

This viewpoint showed little appreciation of the perspective of other students' points of view. Other comments mirrored this lack of understanding, for example, despite the fact that two (25%) of the girls reported engaging in specific muscle toning exercises, one of the girls in this group commented;

F9 I don't really think to tone muscles would be the most important one [reason for exercise] in our year group, because I don't really think we know anything about toning muscles.

Overall, the *fit for sport* group, were characterised by having a high level of perceived competence in their own sporting abilities, and although they were aware of health benefits of exercise, these did not appear to be a primary goal. What is more, their single-mindedness on this point implied a belief that the remainder of their year group thought or felt as they did; sport was primarily for fun, and that is the main reason why all people their age would be likely to take part.

#### *Fitness for self-improvement*

The second group (four boys, five girls) reporting health and fitness as a reason for exercise were those for whom exercise served the purpose of self-development or improvement. This could be as an aim in itself (i.e., being fit to be healthy), to improve appearance through developing muscle tone or bulk, or to improve appearance through losing weight. In each case, the participants reported having made a conscious decision to initiate a programme of exercise in order to achieve their particular goal, contrasting with the *fitness for sport* group who appeared to have arrived at their current exercise involvement through simply continuing with their existing activities from childhood.

M4 Just that I've, um, couple of months ago I decided I didn't really like the way I looked so I decided to do something about it, and then started an exercise regime.

F14 Well, my dad used to run a lot in the mornings, and that's when I was younger, but then I thought recently that I wanted to do more exercise and it's like an easy way to do it I suppose.

Participants varied in the degree to which they appeared to personally endorse the message of the importance of exercise for health, or conversely appeared to be repeating it as undigested advice from parents and teachers. The latter became evident with the use of language such as “should do” or “have to do”, whether in relation to taking exercise, or in taking personal responsibility for being healthy. This reflected different degrees of internalization of messages promoting health through exercise.

F13 I think it's a good idea that everybody has to do PE, 'cause if you didn't then, I don't know, you're not going to be fit when you grow up.

F8 Probably [I do more exercise now] because I think it's more important and, I used to think it was just for fun, but now I know it's just something that you should do, and it's good.

F8 I do it because I know it's important, and 'cause I think it's good to maintain a healthy body really, and um I enjoy it so it's not really anything for me to cry over, yeah, I think it's good.

One of these girls even goes as far as arguing that not doing exercise is “not cooperating”, presumably with parents and teachers, or more generally with received wisdom.

F13 Sometimes they [my friends] think it's a good idea, if you don't do the sports it's like, I dunno, you're not really cooperating, you're not going to get any better or fitter.

However within the interview, and sometimes even within the same sentence, participants varied in their level of endorsement of the health benefits of exercise, suggesting that in many cases they were still in the process of working out their position. For example, in the statements of participant 13 above, her first comment makes an assertion that appears to be fully self-endorsed (“I think it's a good idea”), yet the second (“you're not really cooperating”), implies awareness of an external controlling influence. Similarly, participant 8 above agrees that exercise is important, indicates that this is something she has learned rather than discovered for herself, yet appears to still be in the process of aligning her own reasons (enjoyment) with the growing acceptance that it is something that she should be doing.

One male participant within this group was of particular interest, in that he presented a complete opposite to those engaging in fitness exercise to benefit their chosen sport. Instead, he reported using sport as a means of achieving fitness. Although he clearly excelled at sport, having been selected to play for county and club rugby teams, he talked about wanting to give up rugby as it interfered with his ability to exercise as frequently as he wanted to.

M11 'Cause with rugby, a lot of the things, the thing I don't like about it is, it's sort of at the weekend when I do it, you kind of get injured during the week, kind of like stiff legs and knocks and stuff. So I'm only just about like recovered for the next game, so I can't do anything during the week. So I wasn't going to join until Christmas this year, but my mate said if I didn't then the team would fold, as we haven't got enough players as it is... So I'm starting this season, but I don't know if I'm gonna next year.

He goes on to talk about how he joined his school football team over the summer just as a means for exercise, when his usual form of exercise provided by rugby training was not available.

M11 I think a lot of people join the clubs after school, not because they like the sport but because it's ..... another reason I joined football rather than be part of a team, was like for exercise .... 'cause um we didn't have a rugby thing after school any more, so I just did that for more exercise to keep fit rather than doing nothing.

His comments indicate that he is playing for the exercise, rather than for the game itself, although along the way he finds that he incidentally enjoys it. It is of interest that he starts the sentence generalising to 'a lot of people', but soon cuts himself back to talk only about himself, indicating an awareness that many of his contemporaries may not think like him, and are more concerned with the game than the exercise. An awareness of different points of view is demonstrated by others in the self-improvement group, many of whom show an appreciation that their aims for exercise are different from many of their peers, and that their own views may be unusual. These comments contrast with the lack of appreciation of possible alternative points of view reported by the *fitness for sport* group.

M2 My friends do quite a lot of sport but, um I don't think they're as enthusiastic about *exercise*. They'll play football and stuff like that, but they're not really enthusiastic about the exercise side of sport. I don't think.

F8 I think they [the rest of the year group] would go [to do exercise] to be slim probably. 'Cause quite a lot of them, they don't really follow what you should be doing, so, [would not be] in the healthy part.

In summary, the second theme highlighted how this group of adolescents appreciated the training effects of exercise, but considered them to be of value for very different reasons. A large proportion of participants sought fitness as a means to improving their sport performance, whereas the remainder of students, the majority of whom were among those

perceiving themselves to be less competent at sport, cited different goals such as health, weight loss, and muscle tone.

### **6.3.3 Theme 3: Maintaining involvement versus deterring quitting**

The reasons why people carry out any regular, effortful behaviour are likely to be complex, and not always open to introspection, so it was of interest in this study that the themes elicited from participants as to their reasons for continuing to take exercise were often (but not exclusively) very different those elicited from the question about why they would 'feel bad' if they stopped. Both questions relate to the same attribute, the maintenance of an existing behaviour, yet positive and negative question framing elicited different discussions. Taking just two participants as an example;

#### *Participant 2 (male):*

Response to positive question:

I do exercise because I think it's fun and enjoyable, um, I like it to keep fit and stuff like that. Um, I do it because it something interesting that I enjoy doing as well.

Response to negative question:

I don't know, it's just I feel like if I don't exercise all the time or I'll let them [the team] down, or I [won't] maintain that fitness.

#### *Participant 17 (female):*

Response to positive question:

I do horse riding because like I enjoy it, 'cause like that's what I've always wanted to do, and I do dance to keep up the muscles in my legs for horse riding.

Response to negative question:

Well I'd just think [if I stopped] I'd gain loads of weight. (pause) Because like basically, weight is the main issue for exercise. It's the main reason I do it.

The content of the two responses is clearly different in both cases. The male participant initially cites personal factors such as enjoyment and fitness for exercising, but his reasons for not missing out on exercise sessions are largely social. The female participant shifts from a focus on dedication to a particular sport, to weight concern. In order to explore whether these different responses may have been given due to an artefact in the interview, such as taking time to build up a rapport, or responding through social desirability, in each case the comments were considered in the light of the content of the remainder of the interview. In both cases, each statement was backed up with the discussion elsewhere, suggesting that both responses were valid, and that the adolescents in the present sample did indeed have multiple goals and reasons for exercise. For example, the remainder of responses from participant 17 suggest that the importance of her two goals shifts as a function of the setting she is in. She states on



three separate occasions that she dislikes exercising at school because there are boys around, and would avoid it whenever she could. For example;

F17 [I don't like exercising at school] because of boys. Because I get really self-conscious.

However, due to her daily horse riding outside this setting she is able to get sufficient exercise in a setting in which she is more comfortable to fulfil her perceived need to keep exercising to control her weight. The sum of her responses suggest that her primary motivation in exercise is for enjoyment, but if her preferred activity was no longer available, she would still wish to maintain regular exercise to avoid weight gain. Given the barriers she perceives to exercising at school, and also implicitly in public settings where she could be overseen by boys, it would remain to be seen whether she could find an acceptable alternative if her chosen activity was not available. More importantly, it would be interesting to explore whether this negative motivator of the fear of weight gain would be sufficiently powerful to sustain her exercise levels alone.

For the male example given at the start of this section (participant 2), the deterrent to stopping his current exercise activities is cited as desire not to let his team down. This was a common reason forwarded by boys, and also by one girl also involved in a team sport. However, just as for participant 17, the concern for letting others down appears largely hypothetical as this participant showed no inclination for stopping at present. In fact, although phrased as if it were a negative factor, it appeared that those adolescents who felt they would be unlikely to drop out of their given sport for concern at letting their team down viewed their obligation as something to be proud of. Their comments emphasised that they interpreted this as an indication of being valued.

M2 Yeah I think I would [be letting my team down] because I've done it for so long, and I think we've got such a good, um, team together that would let them all down.

F3 But then ever since then [when I joined] I've been in every single match, and like I *am* the defence..... If I stopped playing hockey I'd feel that I'd let me team down. Because every time they pick me to be in the team, so I'd feel guilty letting them down.

This finding emphasises the importance of the social culture in maintaining physical activity. Moreover, considered alongside comments made by many of the boys that they would be unlikely to engage in the amount of exercise they currently did if they did not take part with their friends, social norms and pressures appear to be pivotal in maintaining boys engagement in sport and exercise. As such, this suggests that while the culture is maintained, high levels of exercise are likely to continue in boys, but if the culture were to

shift to one more like that experienced by girls, boys' exercise levels would be likely to be more under threat. Such a culture shift is likely to occur for example on leaving school.

The variation in responses to positively and negatively framed questions provided considerable insight into adolescents' relationships with exercise. Through asking participants why they reported feeling guilty if they missed out on exercise sessions, many concerns were revealed that had not surfaced previously in the interview. For example the fear of weight gain was cited in four responses to the negatively framed question, but not in any of the responses to the initial positively framed question. While both boys and girls were very conscious of the negative attributions towards people who are overweight, only two of the present sample considered themselves to be currently overweight, which may account for the apparent latency of mentioning this reason for exercise in the majority of cases.

M4 Well, um my dad is quite sort of, he says to me like "You want to keep active, because you don't want to become really fat and that." He's just looking out for me really, but it was my decision, like, to do something about it.

M16 but if you stopped exercising and got fat, people would comment wouldn't they?

In summary, the third theme revealed a difference between reasons for active engagement, or seeking out exercise, and reasons that deter a person from dropping out of sport and exercise. Reasons for seeking exercise were commonly enjoyment, spending time with friends and for health and fitness, which are characteristic of intrinsic forms of motivation from an SDT perspective (Ryan & Deci, 2000b). Deterrents for giving up exercise commonly related to the avoidance of negative factors such as social disapproval, or the deterioration of physical appearance or condition. These factors more commonly relate to the effects of externally controlling environments, and extrinsic goals (Deci & Ryan, 2000).

## **6.4 Discussion**

This section will first discuss the themes to emerge from the interviews in the light of previous research, and with respect to their potential implications for future research. Following this, the discussion will turn to the original research question, to explore how these themes, and individual comments made by participants can provide insight into the basis for introjected regulation for exercise.

The analysis of the interview transcripts of the 18 students in this sample resulted in the extraction of three main themes relating to how and why the adolescents took part in exercise. The first theme related to the expected gender difference in exercise patterns, which was in line with previous research (e.g., Pratt et al., 1999; Caspersen et al., 2000). The second theme related to the different goals that adolescents had for exercise which led them to invest effort into improving their fitness. Students could be largely classified as those wishing to attain fitness for sport, and thus primarily for the ultimate purpose of enjoyment, and those wishing to be fit for reasons of self-development or improvement, such as health and weight control. The final theme related to the differences between the reasons driving adolescents to actively engage in exercise, and those deterring them from ceasing participation. Each of these themes will be discussed in turn in relation to the previous literature.

Sport and exercise played a very different role in the lives of the adolescent boys and girls in this sample. For boys it formed a large part of their social life, and came to be accepted as something that they would be prepared to do in order to spend time with their friends. The majority agreed that they would exercise less if their friends were not active themselves. When boys did join out of school clubs, this tended also to be with their existing friends, providing evidence of a strong peer culture of exercising together. These findings are consistent with quantitative research reporting on the importance of social support (e.g., Gentle et al., 1994; Cardon et al., 2005) and peer relationships (Smith, 2003) in maintaining exercise levels. For example, a recent study exploring the effect of peers on exercise involvement in 10-14 year olds, reported on the differential importance of close friends, the wider peer group, and conflict in sporting settings for exercise engagement (Smith et al., 2006). Smith and colleagues reported that having friends in sport, and being accepted by the wider peer group led to greater motivation for, and enjoyment of sport and exercise, but that conflict with specific peers increased sport related anxiety. This latter finding has not been previously reported in research, so it is of interest to explore whether support for this was found within the present study. Although peer acceptance was not systematically measured, the findings show general agreement with this work. Not only did boys in the present sample enjoy exercise more when taking part with friends and avoid taking part on occasions when their friends were not present, but they also commented that they avoid joining in games involving boys that they do not get on with. Thus, the present findings provide support that adolescent boys are aware of the negative effect on that peer conflict can have on their enjoyment of sport, and that if they perceive this is likely to occur (i.e., through presence of others they dislike) they respond through avoiding the situation.

Unlike the boys, the girls in the present interview sample rarely exercised informally with their existing friends, and sport and exercise were notably separate from their social lives. This finding is consistent with research from many studies aiming to investigate or promote physical activity specifically in girls, which consistently report that adolescent girls' perceive a lack of social support for exercise from parents and peers (e.g., Neumark-Sztainer et al., 2003a; Saunders et al., 2004). However the sample interviewed within the present study, diverged from what was expected from their peer group as a whole, in that they all enjoyed and valued exercise, and showed commitment to taking part regularly despite this lack of support. Their investment of effort into finding opportunities for extra-curricular activities separately from friends was also surprising, given that the girls all reported enjoying exercise more when with their friends, and were confident that being seen to be sporty, trying hard in PE lessons, and getting into school teams were all viewed positively by other girls within their school. Thus, although these findings were consistent with previous research indicating a lack of social support and social norms for exercise within female peer groups, contrary to expectations the girls in the present sample still took part in regular exercise. As such, their high levels of introjected regulation for exercise appeared to be of some benefit, or at least of no hindrance to sustaining regular exercise commitments.

Despite their encouraging activity levels, the comments from adolescent girls regarding how little they talk about their involvement with sport and exercise with their friends, even when they identify their friends as sporty, suggest that exercise is not widely perceived to be an important part of life for girls. A possible reason for this may be that other factors are more important for establishing peer acceptability and status, and other tasks of adolescence such as forming a self-identity. As discussed throughout this thesis, physical appearance is reported to be a primary factor for determining peer acceptance and popularity (Craft et al., 2003), and may be perceived to be at odds with taking part in sports and exercise, and with the conventional female gender role (Malcom, 2003; Crissey, 2006). Therefore, while being competent at sport is perceived positively, actually taking part could compromise girls' attempts to project a feminine and attractive image, and therefore may come to be of secondary importance. For boys however, there is no such conflict. Sport is considered to be a masculine domain, and so to be seen to be active and succeeding in this arena is consistent with male goals for identity and peer acceptance (McCabe & Ricciardelli, 2003).

The second theme extracted from the analyses reflected the broad range of goals for which adolescents considered keeping fit was necessary. The study participants were capable of appreciating the value of the training effects of exercise, and indeed it was surprising how much fitness-related activity was carried out on an individual basis outside

of sport settings in such a young sample (e.g., jogging, weight training, sit-ups). It is likely that the frequency of such activity is over-reported (Klesges et al., 2004), but even allowing for this, the finding that 14 year olds were attending gyms, jogging or engaging in home-based toning exercise at all was unexpected. There were differences in why fitness was valued by participants, which could be partitioned into (i) a fitness goal to enhance their sporting performance, and (ii) a goal of fitness for its own sake, or for further self-development. Relating these two groups to the SDT framework, the different reasons for valuing fitness can be related to different forms of exercise goal content (Deci & Ryan, 2000; Sheldon et al., 2004). The individuals wanting to get fit for sport argued that their ultimate reason for doing so was because sport provided them with a source of fun and a means of spending time with friends. These aims represent intrinsic goals. The group exercising for fitness for self-development goals however report both intrinsic and extrinsic goals. According to past research, seeking fitness for health represents an intrinsic goal, as health is consistent with the satisfaction of basic needs and self-development (Vansteenkiste et al., 2004b). However, keeping fit for weight loss or to improve appearance represent extrinsic goals, as they would be expected to focus the individual towards inter-personal comparisons and away from the satisfaction of basic needs (Sheldon et al., 2004). However, as in study 2, the amount of exercise taken, and degree to which participants endorsed enjoying exercise did not differ between the two groups suggesting that extrinsic goals may not compromise intrinsic motives for exercise.

The final theme to emerge from the analysis related to the very different responses that participants gave to positively and negatively framed questions. There was often a striking difference between the factors that an individual considered to motivate their engagement with sport and exercise, and the factors that deterred them from giving up. In the majority of cases, participants argued that their engagement in sport and exercise was motivated by positive, intrinsic reasons, such as enjoyment, fitness, and socialising. However, factors which they considered to deter them from disengaging were more likely to be represented by negative threats, such as fear of weight gain (even for those not currently considering themselves to be overweight) and the desire to avoid letting others down (i.e., avoiding the disapproval of others). These findings suggest that exercise is maintained by a variety of different sources of motivation. For example, a student reporting exercising to avoid feeling that they had let their friends down, would be expected to score highly on introjected regulation, however, they may also report exercising for enjoyment, and as such be expected to score highly on intrinsic regulation.

The suggestion of a complex series of reasons for exercising, and motivational regulations to match each, has a number of implications of practice and research, first of all in determining the relative importance of each reason for exercise in maintaining behaviour.

For example, negative motivators (i.e., deterrents to stopping) may provide a buffer to allow behaviour to persist when opportunities to exercise for intrinsic regulations are temporarily unavailable. The most poignant example of this could be represented by what happens to boys on leaving school, when the social motivators they have previously experienced to maintain their involvement in frequent informal exercise are likely to cease or reduce drastically. Studies tracking physical activity levels in males show a significant decline in activity after school leaving age confirming that this is a particular time at which males are at risk of becoming sedentary (Caspersen et al., 2000; Thompson et al., 2003a). An investigation into the utility of extrinsic goals to sustain behaviour until new environments supporting intrinsic goals and motives are identified, or to motivate individuals to seek out such opportunities (e.g., enrolling in more formal exercise settings, such as football clubs rather than relying on having friends to play with on an informal basis) would provide a better understanding of the potential contributory role of each type of regulation in behavioural support.

If the different patterns of regulations can be further studied and the potential buffering or moderating effects better described, there may be an opportunity to identify those adolescents at risk of becoming sedentary following the changes to the social environment in adulthood, and to find ways in which to intervene. However, overall, the multiple reasons for exercise reported to co-occur naturally in the present active sample, suggest that developing and maintaining a range of reasons and motives for exercise could be useful in maintaining the momentum of exercise over adolescent transitions.

#### **6.4.1 Evidence for Introjected Regulation**

The initial purpose of the present work was to explore the reasons underlying introjected regulation for exercise in adolescents, with a view to its role in the process of internalization. The transcripts and findings from the thematic analysis were re-examined for evidence of introjected regulation of exercise (e.g., use of words such as *should* or *ought to*, taking part to avoid guilt) (Deci et al., 1994; Vansteenkiste et al., 2005b). There were numerous examples provided in the interviews of participants being aware that they *should* be exercising, but without being able to articulate why they should be doing so:

F3 I'd feel a little bad, because you'd feel, like you haven't done something, there's something you've missed out in a week. I dunno really.

M4 I probably would feel guilty a little bit, I'm not sure why, but I think I would.

M12 I'd probably feel guilty that I didn't do it 'cause... generally I try to do something most days, and that kind of goes out of my pattern. It just doesn't really feel right I guess.

These examples were interpreted to reflect partial internalization, represented by introjected regulation, as they implied that the students were applying rules to their behaviour with little understanding of why the rules represented a good code of behaviour. As such, participants may have accepted their parents' and teachers' assertions that they *should* exercise for the sake of their health, but not have considered why health is a reasonable goal. This evidence is consistent with SDT, which suggests that introjection results when individuals "swallow ideas whole" without integrating them with their existing beliefs and values (Deci & Ryan, 1991).

These responses provide little further information regarding what forms the basis for introjected regulation for exercise in adolescents, so further clarification was sought during the interview. In some cases the further qualifications suggested that responses within the context of exercise were reflective of a more general orientation to act through introjected regulation at a global level. In other words, acting because they felt they should do was not an orientation specific to exercise, but applied equally to other contexts. For example, participants' attitudes to skipping exercise through missing PE lessons were often aligned with their attitudes to missing any activity that they considered they *should* be doing.

F17 No, [I'm never tempted to skive from PE] because I'm not that sort of person.

M4 I wouldn't like to skive a lesson at all really, not necessarily PE but....

These comments suggest that the students were at a stage when they recognised and agreed there were many things in life they *should* do for their own good, and that exercise is one of these. This interpretation relates closely to Vallerand's hierarchical model of intrinsic and extrinsic motivation (HMIEM, Vallerand, 1997b). The model depicts motivation at three levels of generality; situational, relating to individual occasions of experience, contextual, referring to a person's representation of a particular life domain (e.g., sport and exercise settings in general), and global, referring to a person's general orientations across multiple contexts. In line with the HMIEM many comments reflected that introjected regulation may not indicate the presence of environmental factors compromising internalization for exercise, but indicate the influence of a more global orientation.

Aside from the two patterns of responses discussed so far, clear evidence for introjected regulation was difficult to extract from the transcripts, as motivation from several forms of regulation was often referred to at the same time. As noted in the participant

characteristics (Table 6.2), quantitatively measured identified and intrinsic motivation were also high in this sample. Indeed examples of phrases that would commonly be considered to provide evidence of introjected regulation often occurred alongside evidence of identified regulation, such as statements of personal importance. For example:

F8      Probably [I do more exercise now than I used to] because I think it's more important, and I used to think it was just for fun, but now I know it's just something that you should do, and it's good.

This statement contains an indicator of identified regulation ("*it's important*"), intrinsic regulation ("*just for fun*") and introjected regulation ("*it's something you should do*"). Similarly, many statements were made in which external regulation was not clearly differentiated from introjected regulation. A large proportion of boys reported they were likely to feel guilty as a result of missing an exercise session, as they would feel they were letting down their peers. While the feeling of guilt is generally associated with internal sanctions and thus introjected regulation, such comments could similarly be interpreted as representing external regulation, by suggesting that the activity is undertaken in order to avoid the disapproval (punishment or sanctions) of others. While one interpretation of this evidence of may be that adolescents have unstable motivational regulations, it is also possible that more than one form of motivation is evident as they are in a process of change, due to the process of internalization.

When a sample of highly introjected exercisers was initially drawn from the population, it was envisaged that it would result in a set of reluctant exercisers, likely to report relatively low levels of exercise outside school. However this was far from the case. With the exception of one female interviewee, the final sample were highly active, had clear goals for exercise, and gave no indication that it was a struggle or hardship to maintain their current levels of involvement in exercise. Breaking down the association between the different types of exercise the students engaged in and the motivation associated with each, the co-occurrence of the different motivational regulations within individuals was also partially explained by the fact that the different types of exercise were regulated through different forms of motivation. Specifically, sport was undertaken for enjoyment, motivated by intrinsic regulation, whereas the purposeful fitness or training activities undertaken by a large proportion of the sample were motivated through either identified or introjected regulations. Thus, the adolescents appeared to retain their intrinsic enjoyment of exercise as sport which is characteristic of exercise in childhood, but develop new forms of motivation for adopting the initially uninteresting activities necessary for gaining fitness. The findings suggest that both fostering environments which support the process



of internalization, and which protect intrinsic motivation for sport could be useful for maintaining physical activity levels. However, for those adolescents low in competence, or who have already dropped out of sport itself, it is internalization that represents the most fruitful approach to the promotion of physical activity.

In summary, the secondary analysis of interviews showed introjected regulation to be associated with highly positive behavioural outcomes, and to coexist with more self-determined (identified and intrinsic) motivation for sport and exercise without apparent negative effects. This general finding is consistent with theory and research that suggests that introjected regulation can be an adaptive form of motivation in the short term (Pelletier et al., 2001; Standage et al., 2003a), and a necessary stage of the process of the internalization of behavioural motivation (Deci et al., 1994). In addition, it is consistent with the findings of study 2, reporting that high levels of introjected regulation in adolescents were associated with the maintenance of healthy levels of LTE, and decreases in introjected regulation associated with drop-out from LTE.

#### **6.4.2 Limitations**

There are a number of limitations to this study. Firstly, the sample was partially self selected and as such cannot be considered representative of the intended population. Students scoring highly on the introjected regulation scale were invited for interview, and the sample consisted of those who were interested in taking part. There may have been a response bias in the students who were interested in discussing the ideas further, reflecting a greater interest or more positive orientation towards exercise. Although the original questionnaire data shows no significant differences between the motivation of those invited to interview who did, or did not attend (Table 6.1), this self-selection bias still implies caution in the extrapolation of the findings. A measure of self-reported LTE would have been useful in assessing this more conclusively. However, selection bias need not compromise the validity of findings as IPA is not intended to provide a full set of possible responses, but to present examples of how different individuals make sense of a certain area of their life.

A second limitation of the study was the short period of time spent with the interviewees. While time was taken at the start of the interview to attempt to put students at their ease, the responses gained at an initial meeting with students are likely to differ from those gained following further meetings, or by someone with whom they are more familiar. Confidence in study findings would have been improved for example if a second interview was conducted to allow participants to comment on and discuss the interviewer's interpretations of the initial interview. This would provide the interviewee with a chance to respond and comment on their initial statements, in addition to raising any further points

that had occurred to them since the first interview. Difficulty of access to students on an individual basis, both through organisational constraints and teachers' willingness to allow time out of lessons precluded second interviews on this occasion.

A final limitation is in the use of IPA to elicit information and interpret this according to a pre-established theory. While IPA is an interpretive approach that fits well to the extraction of themes in response to a particular line of enquiry, it is intended for use in extracting themes within the data, rather than as a conclusive way of answering a more specific research question. As such the scrutiny of the themes and interview scripts for evidence of introjected regulation and internalization conducted in section 6.4.1 should be interpreted with caution. The implications represent a suggestion or example of what may have underpinned introjected regulation for these individual participants, and should not be generalised to the group as a whole.

## **6.5 Conclusions**

The present study set out to explore the reasons underpinning the introjected regulation of exercise within a sample of adolescents. The purposive sampling technique resulted in a group of highly active participants, who undertook exercise both for fun and for instrumental reasons such as to maintain health and fitness, and control weight and appearance. The motivation towards exercise within this sample was more positive than had been expected. Despite high levels of both introjected and external regulation which are considered to be controlling forms of motivation, and thus associated with lower behavioural persistence and enjoyment, both the adolescent boys and girls reported high levels of enjoyment and involvement in sport and exercise. Many participants showed a sophisticated understanding of the ways in which exercise could be used to fulfil particular goals, such as weight control, improving muscle definition, and the promotion of current and future general health in addition to being something they enjoy.

Both boys and girls appeared to have an idea of how much exercise they wished to take, and when this was not met through school activities or with their existing friends, they took steps to find opportunities to meet their target outside these settings. There were a surprising number of adolescents involved in jogging, and home-based toning exercises. As these activities are rarely intrinsically interesting for adolescents (i.e., they would be unlikely to derive inherent pleasure from them), it is assumed that either introjected or identified regulation is necessary for them to initiate and maintain these activities.

According to both the quantitative results from the initial questionnaires, and the range of responses given by students during the interviews, individuals are likely to be motivated by a combination of regulational types at any one time. It is suggested that this may

provide an example of the pattern of motivational change during the process of internalization, however longitudinal work would be needed to monitor the change in regulations over time for this to be formally tested.

Several indications of the factors underpinning introjected motivation were extracted from the secondary analysis of the interview data. First, that the lack of thought that accompanies the characteristic “swallowing whole” of external justifications that results in introjected regulation meant that students were often unable to justify why they would feel guilty that they missed out on exercise, or why they felt they should have taken part. Secondly, for some individuals, introjected regulations for exercise were indicative of a more global motivational orientation in a number of contexts, not only for exercise. In general, introjected regulation appeared to result from the partial internalization of the recognition of the importance of fitness, whether for health or for sporting performance, or from the wish to avoid social disapproval, i.e., to obtain the high regard of others.

Three areas for further study have been identified; firstly whether the pursuit of fitness for extrinsic goals compromises the process of internalization relative to the pursuit of intrinsic fitness goals; secondly, to investigate the relative contributions made by factors motivating the uptake of exercise, compared with those deterring dropping out; and thirdly, whether compiling motivational profiles for individuals is helpful in identifying adolescents at risk of dropping out of sport and exercise on leaving school, when the social context will no longer complement their reasons and motives for taking part. Each of these areas of study has valid contributions to make in indicating how theoretical constructs can be operationalised in the attempt to promote the internalization of fitness oriented exercise behaviour. Following on from these findings, Chapter 7 presents a study designed to test the first of these suggested future directions.



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# The Effect of Manipulating Goal Content and Autonomy-support on Students' Experience of a Fitness Based PE Class

## 7.1 Introduction

The previous chapters have explored how extrinsic goals for exercise, namely for weight control and appearance, can contribute to poorer levels of self-determined motivation, and through this poorer QoL and behavioural persistence. In Chapter 4, at a cross-sectional level it was reported that negative weight-related physical self-perceptions (WRPSPs), such as body dissatisfaction, perceiving oneself to be overweight, and experiencing social physique anxiety (SPA), contribute to the development of extrinsic goals for exercise. These extrinsic goals in turn were associated with poorer levels of self-determined motivation, and had an indirect negative effect on leisure time exercise participation and QoL. Weight or appearance-related goals were rarely mentioned as a reason for seeking out exercise in the interviews with adolescents reported in Chapter 6, but many participants reported that they would not allow themselves to take less exercise for fear that they would inevitably gain weight as a result. Gaining weight was perceived as a negative event as participants believed that they would be labelled as “fat and lazy” by others, rather than because it would be bad for their health. Thus, there was an indication that extrinsic goals for exercise can occur naturally alongside intrinsic goals in an adolescent population, and have a role in maintaining reported physical activity through providing a deterrent to dropping out.

It is not possible to discern the relative importance of intrinsic versus extrinsic goals in predicting outcomes from observational studies alone. A number of important questions remain unanswered, such as whether extrinsic goals have a more negative outcome for individuals without strong intrinsic goals, or to what degree goal content for exercise can be influenced through instruction and the manipulation of environmental conditions. The answer to such questions is important in establishing whether the manipulation of goal content could provide a route to bringing about behaviour change. To date, research grounded in SDT has focussed more on motivation than goals (e.g., Gagne et al., 2003; Ntoumanis, 2001). The present study is designed to contribute to the body of work that has set out to investigate the effects of manipulating goal content via experimental research designs (e.g., Sheldon et al., 2004; Vansteenkiste et al., 2004b). In order to study this in a controlled setting, which is necessary for the tight manipulation of the constructs of interest, the exercise setting of a school PE lesson was chosen.

SDT proposes that people can become self-determined in adopting activities that are not intrinsically interesting to them, and which are initially motivated by external contingencies through the process of internalization (e.g., adopting laws, or social norms, Deci et al., 1994). Five key elements within the social environment are considered to be necessary to support this process; (a) support for autonomy, (b) provision of a credible rationale of why the activity is important, (c) acknowledgement that the activity is not inherently interesting, (d) provision of structure (i.e. clear instructions and information) and (e) informational feedback (Deci et al., 1994; Reeve et al., 2002). Internalization can take place in one of two ways; in the absence of autonomy-support it will take place through introjection, as values are taken in but not integrated within a person's existing core values, but in the presence of support for autonomy, internalization occurs through integration, as individuals are able to assimilate the new values within their core system of beliefs (Deci et al., 1994). As a result of integrative internalization, people are more likely to experience positive outcomes such as well-being and interest in the activity, and to persist in taking part (Deci et al., 1994; Deci & Vansteenkiste, 2004; Ryan & Deci, 2002). The outcomes of introjected internalization over the longer term are much less positive (Hamer et al, 2002; Deci et al, 1994).

Previous work has shown that internalization can be facilitated/compromised through short introductory statements presented at the start of a task (Deci et al., 1994; Reeve et al., 2002; Vansteenkiste et al., 2004a). For example, in demonstrating the conditions necessary for internalization, Deci et al. (1994) showed that the presentation of an uninteresting computer based task in an autonomy-supportive fashion, which included a convincing rationale (in this case that the task would help improve concentration, and has been useful in training air-traffic controllers), and acknowledgment that the individual may not find it inherently interesting, resulted in greater free-choice engagement in the task and internalization of motivation (i.e., greater self-reported identified regulation). Similarly, Reeve et al. (2002) found a beneficial effect for language learning in college students who were provided with a meaningful rationale, versus no rationale for the activity. The conditions facilitative of internalization not only improved the degree to which motivation was self-determined, but also enhanced reported effort and interest. In both cases, the effects were brought about by a single set of instructions at the start of the activity.

Social environments that facilitate internalization are of particular application to educational settings, as teachers are involved with presenting students with a rationale as to why they should expend energy in working on new tasks every day. Previous work studying the process of internalization has focused on presenting the rationale in either an autonomy-supportive or controlling manner (Deci et al., 1994; Reeve et al., 2002; Williams

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& Deci, 1996), such that the advantages of autonomy-supportive over controlling conditions are now well accepted (Deci & Ryan, 2002). However, one component of the rationale that has not received much attention is the content of the proposed goal for the activity, i.e., that is what students are told that they should aim to get out of taking part in the activity. For example, teachers may explicitly state that a task is part of an exam curriculum, thereby emphasising an extrinsic goal of putting effort into the task for external rewards, or they may present the same task by referring to a more self-concordant goal, such as self-development or contributing to the school community. The intrinsic or extrinsic nature of a person's goal for a given activity has been demonstrated to be of importance for motivational, behavioural, and affective consequences (Deci & Ryan, 2000).

Within the SDT framework, goals for exercise have previously been categorised as intrinsic if they relate to factors such as fun, challenge, socialising, and skill development, and goals such as winning, attaining status, and improving appearance as extrinsic (Furnham et al., 2002; Vansteenkiste et al., 2004b). A more detailed discussion of goal content theory is presented in Chapter 4. Previous work has reported goal content to have an independent effect on outcomes. For example, Vansteenkiste et al. (2004a) provided 11-12 year olds with healthy eating messages with either an intrinsic goal focus (health and fitness), or an extrinsic goal focus (physical appearance), with each presented in either an autonomy-supportive, or controlling manner. An independent effect was reported for goal content on conceptual learning over the longer term (4 weeks) in addition to that of the autonomy-supportive or controlling climate. There was no interaction between motivational climate (i.e., autonomy-support) and goal content. Intrinsic goal framing enhanced conceptual learning when compared with extrinsic goal framing, although it had no differential effect on rote learning, which was instead negatively predicted by autonomy-supportive instructions. Vansteenkiste et al. (2004) concluded that intrinsic goals (and autonomy-support) brought about positive learning effects through better task engagement.

The work of Vansteenkiste and colleagues, and other previous research investigating goal content from an SDT perspective has primarily focussed on its role in the adoption of new behaviours (e.g., Sheldon et al., 2004; Vansteenkiste et al., 2004a). However, it is also of interest to study whether manipulating goal content brings about similar effects on existing behaviours. In the case of adolescent exercise, the problem for public health is not that adolescents are failing to take up exercise, but that they are dropping-out of the physical activities that they took part in during childhood (DoH, 2004). Therefore the present study set out to test whether the manipulation of goal content was possible and useful in encouraging greater volitional involvement and effort during existing PE lessons. As

adolescents are already taking part in PE on a regular basis, it was acknowledged that they may already have established goals for the lesson, and thus the present study would face the challenge of changing goals in addition to creating new goals.

The current study aimed to examine whether the degree of situational self-determined motivation (i.e., degree of internalization) can be influenced through the manipulation of the goal content in the rationale provided for a familiar activity. It aimed to compare the relative impact of intrinsic goal content in relation to extrinsic goal content on student reported outcomes in a PE lesson, and to examine whether goal content has an independent effect over and above that of autonomy-supportive or controlling climates. In line with SDT, it was considered that autonomy-support is a necessary condition for the integration of motivation, and therefore that in a controlling climate, an intrinsic goal focus alone would not be sufficient to promote internalization beyond the level of introjected regulation (Deci et al., 1994). However, consistent with previous research, it was expected that goal content would have an additionally meaningful effect to autonomy-support on the lesson experience (Sheldon et al., 2004). Intrinsic goals for exercise were expected to enhance student outcomes as they are consistent with need satisfaction (Deci & Ryan, 2000). As extrinsic goals can orientate a person towards indicators of external worth and external contingencies and thus, undermine self-determined motivation, it was hypothesised that a rationale focusing on extrinsic goal content could compromise behavioural and affective outcomes in an autonomy-supportive climate.

In order to make these comparisons, five experimental groups were constructed varying the tone and content of the lesson instructions along two axes; an autonomy-supportive versus controlling lesson climate, and the promotion of intrinsic versus extrinsic goals (see Figure 7.1). In line with theory and previous findings, the facilitation of internalization beyond the provision of autonomy-support and a meaningful rationale was operationalised by acknowledging participants feelings towards the activity, and this was therefore added to autonomy-supportive conditions to maximise their potential beneficial effects (Deci et al., 1994). Group 1 received a lesson run in an autonomy-supportive climate that included an intrinsic goal content rationale (focusing on health and fitness), and acknowledgement of participants potential feelings towards a circuits class. These conditions are consistent with those set out for environments which promote internalization (Deci et al., 1994). Group 2 received a lesson run in a controlling climate combined with an intrinsic goal content rationale. Group 3 received an autonomy-supportive lesson, but with a rationale focusing on extrinsic goal content (weight and physical appearance to others). Like group 1, group 3 were also provided with an acknowledgement of their potential feelings towards circuits classes, consistent with the promotion of internalization. Group 4 received a controlling lesson climate, with an extrinsic goal rationale. Finally, group 5 represented



the control group, and were taught in a neutral climate that provided neither autonomy-support nor overt control, and were given no rationale as to what they might get out of the lesson.

**Figure 7.1: Characteristics of the five experimental conditions**

Condition:	1	2	3	4	5
<b>1) Internalization</b>					
Tone of instruction	Autonomy supportive	Controlling	Autonomy supportive	Controlling	Neutral
Acknowledgement	+	-	+	-	-
<b>2) Rationale</b>					
	Intrinsic goal framing	Intrinsic goal framing	Extrinsic goal framing	Extrinsic goal framing	Neutral no goal

The following specific hypotheses were tested:

- a) *autonomy-support* – it was predicted that pupils exposed to the autonomy-supportive lesson climates (groups 1 and 3) would report better motivational, cognitive (value and interest) and affective (well-being and enjoyment) outcomes, and a greater intention to take part in future than pupils in other groups. In addition, greater effort was predicted than for the control group (5);
- b) *controlling lesson climate* – it was predicted that pupils exposed to controlling climates (groups 2 and 4) would report increased effort during the lesson (i.e., a positive short term behavioural effect), such that reported effort would be no different from that reported in autonomy-supportive groups. However, greater effort was predicted for pupils in the controlling groups than for the control group (5);
- c) *intrinsic goal content* – it was predicted that a rationale focusing on intrinsic goal content (groups 1 and 2) would result in better motivational and affective (well-being and enjoyment) outcomes, and a greater intention to take part in future than extrinsic goal content groups (3 and 4). Better outcomes for all domains was predicted than for the no-rationale control group (5);
- d) *extrinsic goal content* – while extrinsic goal content groups (3 and 4) were expected to report poorer affective and motivational outcomes than intrinsic goal content groups (1 and 2) in line with the findings of previous studies of the relevance of physical appearance to adolescents, it was predicted that effort and value attributed to the lesson would not differ from the intrinsic goal content group (i.e., a positive short term behavioural effect). Significantly

better outcomes for all domains was predicted than for the no-rationale control group (5).

In line with previous research findings, it was predicted that there would be no interactions between goal content and lesson climate (Sheldon et al., 2004; Vansteenkiste et al., 2004a). Consistent with the results from studies 1 to 3, girls were expected to report poorer mean levels of motivation for PE, affective outcomes, effort and intentions than boys, but similar responses to boys in response to the intervention manipulations.

## **7.2 Method**

### **7.2.1 Design**

The study was a quasi experimental design, comparing outcomes of four different experimentally manipulated conditions alongside a control group in a PE setting. Participants were randomised by class in line with recommendations for research conducted in communities where the different conditions cannot be isolated (McCall et al., 1998), and the non-independence of participants accounted for through relevant statistical techniques. Previous studies manipulating lesson content have shown that better control of the lesson is attained by non-specialist staff (the University researcher in this case) when class groups are small (i.e.  $\leq 25$ ) (Darst et al., 2001). Therefore a limit on the participants taking part in the study at any one time was set at a single class group. The study protocol and measures were passed by the University of Bath Research Ethics Committee.

The content and phrasing of the rationales presented was based on previous work grounded in SDT (Deci et al., 1994; Vansteenkiste et al., 2004b), read out from a script to ensure the exact same wording on each occasion. A pilot study was conducted to test the measures and procedures for each of the four experimental conditions, which is described fully in Appendix 7.1. The final scripts are presented in Appendix 7.2.

In order to assess students' adoption of an activity stemming from external contingencies, rather than from inherent interest, a lesson that was typically considered to be poorly enjoyed by students was selected. This was an exercise circuits class consisting of a circuit of physical exercises that students complete individually, working alongside others. The lesson content was designed following discussions with a teacher acting in an advisory capacity, supported by the inclusion of a short preference rating item included on the pilot questionnaire. This measure asked students to rate their enjoyment and interest in similar fitness based lessons in relation to the content of other common PE lessons (mean preference rating for exercise circuits = 4.30; football/netball  $M = 5.50$ ; badminton  $M = 4.89$ ; gymnastics  $M = 4.52$ ). The final pool of activities to be incorporated in the

circuit were selected as those which were able to be offered at all participating schools (i.e., using only basic equipment), and that were achievable by students of all abilities. These were; wall press-ups (standard press-ups were judged to be too difficult for all students), sit-ups, shuttle runs, heel kicks, star jumps, lunges, squats, bench step-ups, power skips, and one-legged throwing (further details in Appendix 7.3). This individual exercise format had the additional benefit of ensuring that the outcomes were not confounded by factors restricting levels of participation, such as relying on the ability or level of engagement of other students.

## **7.2.2 Measures**

### **7.2.2.1 Baseline measures**

It was anticipated that students would differ in their responses to the intervention according to a number of individual factors such as their baseline levels of motivation towards PE, their usual experience of PE lessons, feelings in relation to school itself, and usual goals for PE. Therefore baseline measures of these factors were recorded to allow for their control in the final analyses. A copy of all questionnaires are presented in Appendix 7.4.

#### *Contextual Motivation*

Motivation towards PE was measured using the 20 item Motivation for Physical Education Scale (MPE; Goudas & Biddle, 1994). This measure assesses an individual's motivation towards the context of PE for each of the five sub-types of motivational regulation set out by SDT (i.e., amotivation, external, introjected, identified and intrinsic regulation). Responses are recorded on a 7 point likert scale, labelled from 1 (*strongly disagree*) to 7 (*strongly agree*). In previous applications with school aged participants (e.g., 12-13 year olds), the MPE was reported to differentiate between students in intervention and control groups in terms of observable differences in time spent in different activities, and between expected differences in the degree of self-determined motivation between male and female students (Caldwell et al., 2004). In line with Vallerand's Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM, 1997a), motivation at a contextual level is expected to have a strong influence on motivation at a situational level, and therefore provide a means of controlling for differences between students that would be expected regardless of lesson content.

#### *Goal Content*

Goal content of usual PE lessons was recorded through a free-response item, consistent with past work (Vansteenkiste et al., 2004a). The following instruction was given: "*What*

*do you hope to get out of PE? Do you have a particular goal, or goals in mind when you are putting effort into a PE lesson? Please indicate below what goals, if any, you have for PE”.*

#### *Usual Perceived Autonomy-Support for PE*

Students' usual perceived autonomy-support from PE lessons was recorded using a modified version of the 6-item Learning Climate Questionnaire (Williams & Deci, 1996). The amended version has since been found to provide reliable results measured through Cronbach alpha coefficients, in UK adolescent samples (Standage et al., 2005a; Standage & Gillison, in press). The items assess the degree to which the pupils perceive their PE teacher to be autonomy-supportive, reported on a seven item Likert scale labeled from 1 (*strongly disagree*) to 7 (*strongly agree*). Example items include “we feel that the PE teacher provides us with choices and options” and “the PE teacher encourages us to ask questions.”

#### *School Connectedness*

School connectedness can be defined as the feeling of being cared for by people at school, and feeling part of school. It has been linked to prosocial behaviour (e.g., helping others, taking part in extra-curricular activities) and good psychological adjustment (Battistich et al., 2004; McNeely et al., 2002). Connectedness was measured through the School Connectedness Scale (Resnick et al., 1997), which has been reported to show good internal consistency ( $\alpha=.79$ ) in adolescents aged from 11 to 18 (McNeely et al., 2002). This measure combines six items, for example “how much do you feel a part of your school?”, which participants respond to on a seven point Likert scale labelled from 1 (*not at all*) to 7 (*very much*).

#### *Social Participation*

Social participation provides an objective report of the degree to which a child takes part in school life, which like school connectedness, is aligned with better psychological adjustment and pro-social behaviour. This was measured using four items of the Social Participation Scale (Pesa et al., 2000), asking participants to rate how often they play on a school sports team, take part in a school band/choir, take part in clubs, or engage with the community outside school. Responses are recorded on a four point Likert scale, labeled from 1 (*never*) to 4 (*more than once a week*).

#### **7.2.2.2 Outcome variables**

In line with SDT, it was predicted that students' experience of each experimental condition would predict differences in cognitive, psychosocial and behavioural outcomes (Deci &

Ryan, 2000; Ryan & Deci, 2002). Dependent variables representing each of these outcomes were therefore assessed.

### *Cognitive and Affective Outcomes*

The exercise induced feelings inventory (EFI; Gauvin & Rejeski, 1993) was used to measure change in mood and vitality as a result of the intervention lesson. It consists of 12 items relating to how a person feels “right now” (e.g., energetic, happy, tired and worn-out), which can be delivered quickly at pre- and post-test to monitor change. The EFI has been extensively used in an exercise setting (Dunn & McAuley, 2000; Gauvin & Rejeski, 1993), and found to discriminate well between levels of self-efficacy and exercise intensity in an adolescent sample of 168 nine to 17 year olds (Robbins et al., 2004b).

Subscales from the Intrinsic Motivation Inventory (IMI; McAuley et al., 1989) were used to measure students’ interest and enjoyment of the lesson, and the value they placed on the activity. Each scale is composed of seven items, scored from 1 (*not at all true*), to 7 (*very true*). One item from the value subscale was omitted due to repetition<sup>10</sup>. A composite score was calculated for each student for use in the analyses. Although the IMI has been shown to have a weak factor structure when used in its entirety (e.g., Markland & Hardy, 1997), better performance has been reported when separate sub-scales are used independently (e.g., Papaioannou et al., 2006; Vallerand & Fortier, 1998). Previous research has reported good reliability of the subscale of interest and enjoyment with a sample of adolescents, discriminating between environmental perceptions of high or low autonomy-support (Goudas & Biddle, 1994). Similarly, it was found to be sufficiently sensitive to predict of involvement in physical activity over 14 months in 882 Greek adolescents (Papaioannou et al., 2006). The value subscale was developed specifically for use in studies measuring internalization providing an indicator of the degree to which internalization may be introjected (i.e., attributed low value) or integrated (i.e., attributed high value) (Deci et al., 1994).

### *Situational Motivation*

Situational motivation (i.e., motivation for this particular PE lesson) was measured using the 16-item Situational Motivation Scale (SIMS, Guay et al., 2000). The SIMS has been previously been found to be reliable (i.e.,  $\alpha \geq .7$ ) and valid as a measure of student

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<sup>10</sup> The authors suggest that researchers complete the item “I think this activity is important for.....” with a description of their research hypothesis. However, as this research aimed to elicit students’ self reported goals no word was added, in which case the scale authors recommend the statement is simply truncated. In this case it was omitted, as it was considered to overlap too much with the existing item “I think this is an important activity.”

motivation towards a single exercise session in a large adolescent sample (Standage et al., 2003b). In addition, it has been demonstrated to be sensitive to differences in motivation brought about from the promotion of walking for physical activity to school children in either autonomy-supportive or controlling environments (Prusak et al., 2004). As the SIMS does not contain a scale relating to introjected motivation, the four items measuring introjection on the MPE (used at baseline) were also included, following amendment to reflect the situational rather than contextual setting.

#### *Need Satisfaction*

Need satisfaction from the lesson was measured using three five-item measures for autonomy (Standage et al., 2003a), competence (McAuley et al., 1989) and relatedness (Richer & Vallerand, 1998). All three measures were used in a previous study (see Chapter 6), where good internal consistency was demonstrated ( $\alpha \geq .85$ ), discriminating between adolescents in terms of their leisure time exercise (LTE) and QoL.

#### *Behavioural Outcomes*

Effort was measured using the effort subscale of the IMI (McAuley et al., 1989). This measure has previously been found to be reliable within an adolescent sample (Papaioannou et al., 2006).

#### *Intention*

Intention was measured using a single question asking participants if they would be interested in taking parting in future circuits classes run at the school "*We are looking at the possibility of running some optional circuits classes like the one you have just done, in lunch times or after school. Would you be interested in joining something like this?*" Participants recorded their responses on a seven point Likert scale labelled from 1 (*not at all interested, I definitely wouldn't try it*) to 7 (*extremely interested, I would definitely want to take part*). Due to ethical concerns relating to raising expectations, this phrasing was agreed with each school before the study took place, and was presented as a possibility that was being explored rather than as an opportunity that would definitely arise.

### **7.2.2.3 Manipulation checks**

Three measures were included to check that the lesson climates were perceived as intended through the experimental manipulations;

#### *Perceived Autonomy-Support*

Firstly, the student's perception of autonomy-support was measured using a six item measure (Black & Deci, 2000) that has been previously found to be reliable and valid in a

school sample (Standage et al., 2005a). Responses were recorded on a seven item Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

### *Perceived Goal Focus*

The questionnaire for goal focus was constructed based on a previous measure used in an experimental setting to measure perceptions of task/ego-involving conditions (Standage et al., 2005b). Three items were constructed to measure each of the intended goal content climates. For example, intrinsic goal focus items included; “the main focus was to improve my health and fitness”, extrinsic goal focus items included; “the focus was to help me to stay slim and look better”, and the no-goal focus items included “doing this workout was not for any particular purpose.”

### **7.2.3 Recruitment**

Participants were recruited through their school. Head teachers of schools not involved with the previous studies within two local education authorities were approached, selected sequentially from a published list. Head teachers willing to take part provided written consent on behalf of students acting in *loco parentis* in line with British Psychological Society guidelines (2000). All students within the target school year group (Year 9, ages 14-15) were eligible to take part. Letters were sent home to parents informing them of what the study would entail (appendix 7.5), and asking them to contact the school or research team if they would prefer their child *not* to take part (passive consent). Students provided verbal consent at the start of the study, and were reminded at the start of the intervention lesson that participation was optional and that their schooling would not be affected in any way if they chose not to take part. In most schools several PE classes were run in parallel, providing students who chose to opt out with an alternative PE lesson to join. When this was not the case, students could choose to join in with the activities but not complete the questionnaires, or to sit out of the lesson completely.

### **7.2.4 Procedure**

The researcher visited each school prior to embarking on the study to discuss the study with PE teachers, emphasising that they would be asked to have no involvement in the target lesson, and providing a written protocol (see Appendix 7.6). The study was described to students by the researcher in a classroom or school hall, at least one week ahead of the target PE lesson. Baseline measures were taken at this time. This time lag was included to prevent recall effects from previous similar questionnaires, to prevent response fatigue, and to allay the confounding effects of common method variance. The intervention session itself took part in a usual timetabled PE lesson, to which students had been previously allocated in line with usual school procedure. The number of lessons run in each school varied according to school size, and practical issues such as timetable

clashes with other school's PE lessons during the four month data collection period. Classes were stratified by gender, and then randomly allocated to experimental condition. Randomisation was conducted by drawing numbers representing each experimental condition (i.e., 1 to 5) from an envelope (one for male and one for female lessons) for allocation to consecutive classes. Randomisation took place without replacement to ensure that approximately equal numbers of lessons for each condition were run. Neither students nor their teachers were aware of the condition to which they were allocated, nor of the details of the differences between conditions.

Immediately before the experimental PE lesson, students were asked to complete the EFI. In order to maximise the lesson time spent in physical activity, all other pre-test measures were recorded at baseline only. Following completion of the EFI, a script was read out by the researcher (Appendix 7.2) framing the lesson and providing instructions for all the individual activities in a controlling, autonomy-supportive or neutral manner as specified by the randomisation condition. Each activity was then demonstrated, accompanied by minimal scripted instructions in line with randomisation condition. During this process, teachers were provided with a brief written reminder of the protocol for avoiding interacting with students during the lesson, and a clip-board containing a feedback sheet for teacher observations. This was in part to reinforce the impression to students that their teachers were working and therefore not involved in the lesson, and partly to distract teachers themselves from getting involved. Students were asked to wear a numbered sticker on their shoulder, to allow the researcher to note down students who interacted with teachers outside the protocol, who did not participate, or any other anomalous events. Teachers were also asked to note down any such events from their position as observer.

The active part of the PE class was then started. The researcher led the students in a short warm up, and then began the circuit of activities by alternating 30 seconds of activity with 30 seconds of rest. At the end of every 30 second period, a whistle was blown to signal that participants should start/stop an activity, or move to the next work station. Between eight to 10 work stations were included (dependent on the size of the gym), to provide sufficient student choice and enable the number of students on each workstation to be small and manageable. Half way through the lesson students were grouped in the centre of the gym for a two minute break. During this time they were informed that they were now half way through the circuit, and were reminded of the lesson goal content (where present) in the appropriate autonomy-supportive/controlling manner (e.g., "remember to get the most out of this session in terms of your health and fitness..."). At the end of the class, participants completed the final questionnaire packet, and were asked to stick their numbered label to the front of their questionnaire. Students were reminded that there were no right or wrong answers and that their responses would not be



seen by their teachers. They were asked to spread out across the gym to complete the questionnaires independently.

All classes were run by the principal researcher, who also kept a diary of her own perceptions of each lesson, recording characteristics of the lesson tone (e.g., whether the students were engaged, unruly, or unusually quiet), and highlighting potential difficulties to the standard approach (e.g., unwarranted teacher input or the need to enforce discipline). These notes provided a cross-reference against which to check anomalous results for particular classes, and to provide insights into the final results.

### **7.2.5 Data Analysis**

The planned data analysis was in two stages; preliminary analysis using analysis of covariance (ANCOVA), and a main analysis using hierarchical linear modeling (HLM). It was predicted that a significant proportion of the variation in responses would be explained at the class level, whether through the main effect of experimental manipulation, through a shared class tone or atmosphere, or through taking part in single sex groups. For example, it was considered likely that a student taking part in a PE class full of highly motivated, enthusiastic and focussed individuals would respond very differently to the same objective circumstances (e.g., lesson instructions) than a student taking part in a class composed of generally amotivated students, or one run with poor discipline. To take account of these group level effects, it was planned to examine the results through hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002). HLM effectively allows for the control of high intra-class correlations (i.e., lack of independence of individual responses within a class) which may exert an influence on the proportion of the outcome that can be attributed to the independent variable. This results in an unbiased and efficient estimate of the individual level effects, accounting for the cluster (class) effect. The extent to which the results reflect class or individual level effects can be established through ANOVA, which partitions the variance into that explained at the individual level, and that explained at the group level. High intra-class correlations indicate that much of the variance in outcomes is explained at the group level, confirming that a HLM analysis should be conducted. Very low intra-class correlations indicate that very little variation occurs as a result of group effects, and as such HLM would be of limited explanatory power, and conventional individual level analyses are more appropriate.

However, a preliminary data analysis of the data through ANOVA reported very low intra-class correlation coefficients (ICCs), indicating that group level effects explained less than 10% of the variance in all outcomes except for need satisfaction, and explained less than 5% of the variance in half of the outcomes (see Appendix 7.3). As such HLM was not employed, and conventional group analyses were conducted using ANCOVA to assess

the extent of between-group differences whilst controlling for the covariates which are expected to have an effect on the outcome. ANCOVA provides a similar test of between-group effects to standard ANOVA, but reduces the unexplained error in the model by additionally controlling for differences in levels of covariates between groups. Using a GLM (general linear model) approach, the effects of covariates on the dependent variable are first calculated through regression analysis to calculate an adjusted mean for each group. The main effect brought about by the independent variables is then tested on the adjusted group means. In interpreting the results of ANCOVA, the beta coefficients calculated for each covariate represent the independent effect when all other covariates are accounted for, i.e., the effect that would be detected if that covariate were to be entered last in a hierarchical regression analysis. The preliminary analysis was conducted through a series of 2 (sex) by 5 (experimental condition) ANCOVAs, controlling for baseline measures for each of the six dependent variables. All analyses were conducted using SPSS version 14.

The main analysis was conducted through a series of 2 (sex) x 5 (experimental condition) ANCOVAs, controlling for baseline connectedness, contextual motivation towards exercise, and usual perceptions of autonomy-support in PE (as indicated by correlations for each outcome).<sup>11</sup> For parsimony of statistical models, gender was excluded from analyses where no direct or interaction effect on outcomes were reported in preliminary tests. Due to the lack of class effect, three alternative models were therefore tested to compare the explanatory power of models incorporating or excluding between- and within-group effects. The inclusion of within group (i.e., intra-individual effects) analyses is in line with the tenets of SDT (Ryan & Deci, 2002), which predicts that it is subjective perceptions of a lesson environment that are predictive of outcomes, rather than objective indicators (i.e., experimental condition). The proportion of the variance explained in each outcome ( $R^2$ ) was compared for each model.

*Model 1:* Between-group differences only were analysed, in line with the initial hypotheses. Outcomes were predicted by the main effects of group and gender, controlling for the baseline covariates indicated by correlation analysis (e.g., contextual motivation for exercise and school connectedness).

*Model 2:* Analysis of both between- and within-group differences. Outcomes were predicted by the main effect of group (and gender where an association was established

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<sup>11</sup> A planned contrasts approach was not used as the initial hypotheses were no longer applicable due to the reconceptualisation of experimental conditions in the light of the unsuccessful attempt to manipulate intrinsic goals, see section 7.3.2.2.

in Model 1), controlling for covariates of baseline individual attributes, and lesson climate perceptions (intrinsic goal focus, extrinsic goal focus, and autonomy-support).

*Model 3:* Analysis of within-group effects only. Outcomes were predicted by the main effect of lesson climate perceptions (intrinsic goal focus, extrinsic goal focus, and autonomy-support), controlling for the baseline covariates indicated by correlation analysis (e.g., contextual motivation for exercise, and school connectedness). As Model 3 tested continuous variables rather than differences between groups, it was analysed through hierarchical regression analysis. Baseline covariates were entered simultaneously as a first step, and perceptions of lesson climate entered together as a second step to examine whether they contributed additional explanatory variance. Interaction terms between perceptions of goal content and autonomy-support were entered as a third step of the analysis of Model 3, and were included as covariates in a final exploratory step for Model 2, to establish whether these added additional explanatory power to the models.

## **7.3 Results**

### **7.3.1 Descriptive Statistics**

Following the deletion of cases from the single class outlier identified, the final sample comprised 479 participants (216 (45%) male, 263 (56%) female), nested within 24 class groups. The mean age of participants was 13.74 (SD=.30; range 13.1 to 15.0 years). Participants were drawn from six comprehensive schools in the South West of England. The schools were all based in small towns in rural areas, ranging in size from 1050 to 1653 pupils, of whom almost all (>93%) were of white British origin. Three schools served populations slightly above the national average for socio-economic status (SES), two served populations of slightly below average SES, and one drew pupils of approximately average SES. One school was classified as a specialist sports college, although it still served pupils largely from the local catchment area who were of all levels of sporting ability, rather than selecting a significant proportion of more athletic students.

The number of intervention classes run in each school ranged from two (39 students in total) to eight (246 students). Class size ranged from 8 to 34 pupils, with an average class size of 27 students (SD=5.24, range; 8 to 34, median = 28). All classes were run in single sex groups (12 all boy classes, 12 all girls) in line with usual PE procedure. Following randomization, six classes were run under conditions one, two and four, five classes were run under condition three, and three classes of condition five. The distribution of participants, and gender split between experimental conditions is shown in Table 7.1.

**Table 7.1 Distribution of participants and completed study response rate between experimental conditions**

		Experimental condition				
		1	2	3	4	5
Male						
	No. classes	3	3	3	3	1
	No. pupils	40	61	52	76	24
Female						
	No. classes	3	3	2	3	2
	No. pupils	64	68	46	65	54

At baseline, six different constructs were assessed; contextual motivation towards exercise, contextual need satisfaction from exercise, perceived autonomy-support of a usual PE lesson, usual goals for PE, social participation and school connectedness. In line with expected gender differences from the findings of previous chapters, differences in baseline measures were analysed using *t*-tests. Significant differences were detected in competence and four types of motivational regulation (all except for external regulation; see Table 7.2). Boys reported greater introjected, identified and intrinsic motivation towards exercise than girls, but less amotivation. They also reported greater satisfaction with the need for competence. However, the size of these effects were small in all cases, except for teacher rated disengagement which was significantly more common in girls.

A series of two-way (gender by experimental condition) ANOVAs were conducted to test for differences at baseline across experimental conditions while controlling for gender. In addition MANOVA was used to assess variables that were conceptually related (i.e., motivational subtypes, and need satisfaction), to reduce the likelihood of Type II error. Post hoc tests were then applied to significant outcomes to further assess the influence of individual constructs. Differences between experimental conditions are described in Table 7.4. Self-reported goals were categorised as relating to health and fitness, fun, personal development (considered to be an intrinsic goal), weight and appearance, and other extrinsic goals. The frequency of each goal from the free-response item is shown in Table 7.3, and differences between groups tested through Chi-square tests. Contrary to expectations, significant differences were found between groups for six baseline variables; amotivation, identified regulation, intrinsic motivation, competence, relatedness, and usual perceived autonomy-support in PE. A significant effect for the interaction between experimental condition and gender was also found for six baseline variables; identified and intrinsic regulations, competence, relatedness, social participation and usual perceived autonomy-support in PE. In reflection of these unexpected differences between

groups, all final analyses were conducted controlling for baseline variables by entering these as covariates into the statistical model.

**Table 7.2 Gender differences between baseline variables**

	Male (N=253)		Female(N=276)		Effect size (d)
	mean	SD	mean	SD	
<b>Amotivation</b>	2.27	1.13	2.48 *	1.13	-0.19
<b>External regulation</b>	3.57	1.30	3.60	1.33	-0.02
<b>Introjected regulation</b>	4.10	1.16	3.81 **	1.13	0.25
<b>Identified regulation</b>	5.38	1.19	5.09 **	1.14	0.25
<b>Intrinsic regulation</b>	5.40	1.12	4.97 ***	1.19	0.37
<b>Autonomy</b>	4.03	1.30	3.92	1.33	0.08
<b>Competence</b>	5.23	1.15	5.00 *	1.21	0.19
<b>Relatedness</b>	4.79	1.12	4.86	1.14	-0.06
<b>Usual perceived autonomy in PE</b>	4.60	1.08	4.52	1.18	0.07
<b>Social participation</b>	1.97	0.48	1.96	0.63	0.02
<b>School connectedness</b>	4.79	1.00	4.88	1.11	-0.08
<b>Age</b>	13.75	0.30	13.76	0.30	-0.03
<b>Teacher rated drop-out</b>	.05	.21	.21***	.41	-.48
<b>% reporting intrinsic goals for PE</b>	57%	-	61%	-	NS
<b>% reporting extrinsic goals for PE</b>	9%	-	13%	-	NS

Note: *t*-tests of difference between sexes: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ , NS =  $p > .05$   
 Effect size (d); small  $\geq .2$ , moderate  $\geq .5$ , large  $\geq .8$

**Table 7.3 Percentage of students reporting intrinsic/extrinsic contextual goals for PE in each experimental condition**

Experimental condition:	1 AS, IG	2 C, IG	3 AS, EG	4 C, EG	5 neutral	Chi-square df (1,4)
<b>Intrinsic goals</b>						
Health and fitness	39	23	31	34	35	6.45, NS
Fun	16	13	11	8	13	3.36, NS
Skill / personal improvement	30	34	32	33	49	7.49, NS
<b>Extrinsic goals</b>						
Weight and appearance	5	1	3	7	1	6.19, NS
Other extrinsic goals	6	7	8	7	14	4.68, NS

Notes: AS = autonomy-supportive, C = controlling, IG = intrinsic goal content, EG = extrinsic goal content

## 7.3.2 Preliminary Analyses

### 7.3.2.1 Data screening

The composite scores for baseline variables were tested for normality and homogeneity of variance, in order to ensure the assumptions of the preliminary analyses were met. ANOVA requires that variables are normally distributed, and have homogenous variance across groups. Ten of the 13 variables were found to be skewed, and three to have significant kurtosis (see Table 7.5). Transformations were first attempted by calculating the square root of each variable, and when this provided no improvement in normality, log transformation was computed. The normality of distributions of social participation, and amotivation were the only variables to be improved by (log) transformation, so were retained in this format for subsequent analyses. However, the inclusion of the remainder of non-normal variables was not considered of serious threat to reliability, as although normally distributed variables are desirable for improving the power of results, if all variables are moderately skewed to the same extent, as is the case with the variables with this dataset, the improvement to results through transformation is often found to be minimal (cf. Tabachnick & Fidell, 2001). Furthermore, for the analysis of covariance normality is assumed for the sampling distribution, rather than the specific sample data, and thus ANCOVA is robust to moderate deviation from normality (cf. Tabachnick & Fidell, 2001).

**Table 7.4 Comparison of baseline variables between experimental conditions**

		Experimental condition					MANOVA	Significant Effects
		1	2	3	4	5	df = (9,519)	
		AS, IG	C, IG	AS, EG	C, EG	neutral		
<b>Motivation</b>	amotivation	2.41 (1.08)	2.70 (1.22)	2.37 (1.10)	2.32 (1.11)	2.02 (1.06)	$F=4.91, p<.01$	gender & interaction
	external regulation	3.76 (1.29)	3.75 (1.37)	3.55 (1.34)	3.38 (1.21)	3.53 (1.41)	$F=1.32, NS$	-
	introjected regulation	4.09 (1.12)	3.88 (1.22)	3.87 (1.08)	3.91 (1.19)	4.02 (1.13)	$F=2.09, p<.05$	gender
	identified regulation	5.26 (1.18)	5.01 (1.33)	5.09 (1.22)	5.34 (1.05)	5.45 (1.04)	$F=4.31, p<.001$	gender, condition & interaction
	intrinsic regulation	5.15 (1.17)	4.94 (1.27)	5.09 (1.19) <sup>B</sup>	5.24 (1.08)	5.53 (1.15)	$F=6.00, p<.001$	gender, condition & interaction
<b>Need Satisfaction</b>	autonomy	4.00 (1.30)	3.84 (1.40)	3.88 (1.25)	3.87 (1.26)	4.42 (1.33)	$F=2.64, p<.01$	-
	competence	5.04 (1.11)	4.81 (1.30)	5.04 (1.25)	5.25 (1.11)	5.51 (1.04) <sup>BD</sup>	$F=5.36, p<.001$	gender, condition & interaction
	relatedness	4.80 (1.12)	4.69 (1.14)	4.78 (1.15)	4.84 (1.13)	5.09 (1.06)	$F=1.92, p<.05$	condition & interaction -
<b>School factors</b>	usual perceived autonomy in PE	4.65 (1.09)	4.32 (1.18)	4.40 (1.23)	4.58 (1.04)	4.91 (1.08) <sup>BC</sup>	$F=4.44, p<.001$	condition & interaction
	social participation	2.01 (.55)	1.84 (.50)	1.82 (.46)	2.10 (.67) <sup>BC</sup>	2.05 (.52)	$F=3.19, p<.005$	condition
	connectedness	4.77 (1.23)	4.76 (.97)	4.87 (.97)	4.82 (1.14)	4.99 (.89)	$F=.72, NS$	-

Notes: AS = autonomy-supportive, C = controlling, IG = intrinsic goal content, EG = extrinsic goal content

Post hoc tests: <sup>B</sup>=significantly different from group 2; <sup>C</sup>=significantly different from group 3, <sup>D</sup>=significantly different from group 4

**Table 7.5 Distribution of Independent and Dependent Variables for Checking the Assumptions of the Analysis**

	Skewness			Kurtosis		
	Statistic	Std. Error	Standardised statistic*	Statistic	Std. Error	Standardised statistic
<b>Baseline perceived autonomy-support in PE</b>	-0.53	0.11	-4.86	0.16	0.22	0.72
<b>School connectedness</b>	-0.58	0.12	-4.78	-0.12	0.24	-0.51
<b>Social participation</b>	1.24	0.11	11.08	6.40	0.22	28.75
<b>Transformed social participation</b>	-0.30	0.11	-2.68	.42	0.22	1.87
<b>Contextual Intrinsic regulation*</b>	-0.63	0.11	-5.68	-0.19	0.22	-0.84
<b>Contextual Identified regulation*</b>	-0.76	0.11	-6.85	0.27	0.22	1.20
<b>Contextual Introjected regulation</b>	-0.05	0.11	-0.42	-0.30	0.22	-1.36
<b>Contextual External regulation*</b>	0.14	0.11	1.22	-0.62	0.22	-2.77
<b>Contextual Amotivation</b>	0.91	0.11	8.14	0.36	0.22	1.60
<b>Transformed amotivation</b>	0.04	0.11	0.35	-0.95	0.22	-4.28
<b>Contextual autonomy</b>	-0.08	0.11	-0.72	-0.39	0.22	-1.76
<b>Contextual competence</b>	-0.77	0.11	-6.89	0.42	0.22	1.90
<b>Contextual relatedness</b>	-0.51	0.11	-4.61	0.06	0.22	0.26
<b>Perceived intrinsic goal focus</b>	-0.80	0.11	-7.19	1.01	0.22	4.54
<b>Perceived extrinsic goal focus</b>	-0.35	0.11	-3.15	-0.20	0.22	-0.88

Notes: \* skewness or kurtosis is indicated by a standardised statistic  $\geq 2$

### 7.3.2.2 Manipulation check

A manipulation check was carried out to establish whether each experimental condition was perceived by participants as had been intended. Cronbach alpha coefficients for inter-correlation of items within each scale were calculated to assess internal consistency; intrinsic goal content  $\alpha = .83$ , extrinsic goal content  $\alpha = .90$ , no-goal content,  $\alpha = .73$ , and perceived autonomy-support  $\alpha = .88$ . All alphas were considered acceptable according to convention ( $\alpha > .7$ ; Nunnally & Bernstein, 1994). The mean for each scale was computed and used as a composite variable for each aspect of the lesson environment.

Differences between the mean ratings of perceived lesson environment for each experimental condition were tested using between groups ANOVA, supplemented by post



hoc Bonferroni tests. Table 7.6 shows the mean ratings and test statistics for each element. A significant overall effect was found for both extrinsic goal content and perceived autonomy-support in the anticipated directions, indicating that participants perceived these two manipulations as intended. Perceptions of the intrinsic goal content condition also differed significantly between groups, but in the opposite direction to that expected. If the manipulation had been successful, the highest ratings of intrinsic goal content would have been reported by participants in conditions 1 and 2, following receipt of the intrinsic goal content script. However, participants in condition 2 reported the lowest perceptions of intrinsic goal content of all groups, whereas the highest rating was reported by participants in condition 4 (extrinsic goal content, controlling condition). Overall, perceptions of intrinsic goals were higher in the extrinsic goal content condition than intrinsic condition suggesting that although the instructions intended to focus participants on their weight and appearance, they had an additional effect of increasing the salience of health and fitness goals. There were no significant differences in perceptions of the absence of goal content, although these were higher in condition 5 than all other groups, as was intended.

**Table 7.6 Mean (standard deviation) values of lesson perceptions for manipulation check**

	Experimental Group					ANOVA F test
	1 AS, IGC	2 C, IGC	3 AS, EGC	4 C, EGC	5 control	
<b>Perceived intrinsic goal</b>	5.00 (1.15)	4.67 (1.50) <sup>A</sup>	4.91 (1.27)	5.06 (1.22) <sup>B</sup>	4.73 (1.31)	F(4,544)=4.49, p<.001
<b>Perceived extrinsic goal</b>	4.23 (1.42)	3.81 (1.41) <sup>A</sup>	4.69 (1.30) <sup>AB</sup>	4.84 (1.32) <sup>AB</sup>	3.93 (1.28) <sup>CD</sup>	F(4, 544)=16.1, p<.001
<b>No goal</b>	3.03 (1.12)	3.11 (1.05)	3.08 (1.00)	2.97 (1.25)	3.27 (1.17)	F(4, 497)=.87, NS
<b>Perceived autonomy-support</b>	4.22 (1.30)	3.71 (1.15) <sup>A</sup>	4.51 (1.17) <sup>B</sup>	3.77 (1.26) <sup>AC</sup>	3.87 (1.22) <sup>C</sup>	F(4, 524)=9.22, p<.001

Notes: The highlighted boxes represent the cases where the highest values would be expected, following successful class climate manipulations; AS =autonomy-support, C=controlling, IGC=intrinsic (health) goal content, EGC= extrinsic (weight and appearance) goal content; post hoc tests:<sup>A</sup>=significantly different from group 1; <sup>B</sup>=significantly different from group 2, <sup>C</sup>=significantly different from group 3, <sup>D</sup>=significantly different from group 4

To assess why this effect may have occurred, scores for each individual class group were scrutinised, and anomalous results by class cross-checked against diary notes made at the time. This process led to the identification and elimination of one class in condition 2, for which there was a particularly low mean score for perceived intrinsic goal content (mean=3.73, SD=1.49). This was the first of all the classes to be run within the present study, and the significant difference in lesson perceptions was therefore considered to have been likely to result from a lack of familiarity of running the study, such that the session may have been delivered less confidently or fluently than later classes. Removing this class from the analysis resulted in a slightly improved mean score for condition 2 of 4.71 (SD=1.25). While this adjustment did not alter the overall result significantly ( $F(4,524)=2.58, p<.05$ ); participants in condition 2 no longer scored significantly lower than the other intrinsic goal content group (condition 1), but remained significantly different from those in condition 4. Scrutinising individual classes within condition 4 showed that the two highest ratings for intrinsic goal content of all lessons were reported by classes within this condition. However, these means were not sufficiently distant from those recorded in other lessons to be considered outliers, and as there was no reason to question the reliability of results suggested from diary notes these classes were retained in the analysis.

As a result of the findings that the intrinsic goal content manipulation had not been successful, and to avoid confusion in the interpretation of results, the intrinsic goal groups were relabelled “standard rationale” reflecting the fact that a rationale had been presented but did not result in a change in perceived goal content.

### **7.3.2.3 Relationships between independent and dependent variables**

A series of correlations were conducted to explore the relationships between dependent variables prior to constructing statistical models (Table 7.7). The first four covariates considered were baseline individual level attributes which were considered to have a potential effect on outcomes, based on the findings of previous chapters and previous literature (e.g., Gagne et al., 2003; Hagger et al., 2003). The final three covariates represented the perceptions of the lesson recorded at the individual level (i.e., perceptions of autonomy-support and goal focus). These final covariates were included to examine whether individual differences in the perception of the lesson climate differentiated between outcomes within each experimental condition.

The self-reported behavioural outcomes of effort and intention, and the cognitive outcome of perceived value of the lesson were significantly positively related to all variables. Of the affective outcomes, enjoyment was significantly positively correlated with all factors, but change in well-being over the lesson was only significantly (but weakly,  $r = .11$ ) related to

baseline motivation (calculated as a composite self-determination index from all five regulations).

Situational motivation and need satisfaction following the intervention (controlling for respective contextual level ratings at baseline) showed some significant associations with covariates, however the majority of these significant associations were weak ( $r < .2$ ). The largest was for school connectedness, which showed a positive and significant association with all need satisfaction variables, and all motivational regulations expect for external regulation. Identified and introjected regulation were also correlated significantly and positively with perceptions of autonomy-support in usual PE lessons.

Perceptions of the lesson climate were significantly related to all outcome variables, with the exception of the relationship between extrinsic goal rationale and change in well-being. Stronger perceptions of autonomy-support, and of either intrinsic or extrinsic exercise goal focus were related to better motivational, behavioural and affective outcomes of a single PE lesson. Thus, the correlations provide justification for focusing efforts on the manipulation of these aspects of the PE environment to improve the experience of PE for adolescents. Contrary to predictions of a negative effect of extrinsic goals, the correlations for intrinsic and extrinsic goal content were in the same direction; both goal contents were positively associated with adaptive outcomes.

Correlations between predictor variables (covariates) were significant, but below the threshold considered to indicate multi-collinearity (i.e. they were well below .9; cf. Tabachnick & Fidell, 2001). However, they provide an indication of variables which may overlap in the information they contribute to explaining the differences between outcomes, which can be used to guide which should be included in a final parsimonious model.

**Table 7.7 Correlations between individual level predictor variables, and with outcome variables for the total sample**

Outcome variables	Predictor variables (individual level)						
	1	2	3	4	5	6	7
<i>Correlations between predictor variables</i>							
1) Social participation	-						
2) School connectedness	.28***	-					
3) Usual level of perceived autonomy-support in PE	.20***	.51***	-				
4) Baseline motivation (RAI)	.34***	.45***	.60***	-			
5) Perceived lesson autonomy-support	.13**	.26***	.30***	.49***	-		
6) Perceived standard rationale	.18***	.27***	.27***	.30***	.42***	-	
7) Perceived extrinsic goal rationale	.09	.09	.14*	.12**	.30***	.59***	-
<i>Behavioural outcome measures</i>							
Perceived effort	.17***	.34***	.28***	.35***	.31***	.47***	.22***
Behavioural intention <sup>a</sup>	.24***	.27***	.21***	.28***	.40***	.48***	.32***

**Table 7.7 (continued)**

Outcome variables	Predictor variables (individual level)						
	1	2	3	4	5	6	7
<i>Affective and cognitive outcome measures</i>							
Change in well-being	.08	-.02	.05	.11*	.12**	.13**	.08
Enjoyment	.21***	.33***	.32***	.38***	.49***	.55***	.33**
Value of the lesson	.24***	.32***	.30***	.36***	.46***	.61***	.40***
<i>Need satisfaction outcomes<sup>b</sup></i>							
autonomy	.01	.16**	.04	.05	.52***	.24***	.11**
competence	.08	.11*	.08	.07	.41***	.24***	.12**
relatedness	.10*	.14*	.00	.02	.36***	.22***	.10*
<i>Motivational outcomes<sup>b</sup></i>							
amotivation	-.08	-.12*	-.08	-.07	-.24***	-.32***	-.22***
external regulation	.01	-.03	.02	-.06	-.18***	-.05***	-.05***
introjected regulation	.10*	.14*	.15**	.11*	.40***	.44***	.30***
identified regulation	.08	.14**	.15**	.09*	.52***	.59***	.42***
intrinsic motivation	.07	.10*	.07	.09	.50***	.54***	.36***

Notes: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ ; RAI: relative autonomy index

<sup>a</sup> non-parametric (Spearman) correlations were computed intentions, as the data were not continuous

<sup>b</sup> partial correlations were computed for need satisfaction and motivation variables, to control for contextual baseline scores

### 7.3.3 Final results

#### 7.3.3.1 Need satisfaction

A significant overall effect was found for all three models. The model with the greatest explanatory power was Model 2 (Wilks' Lambda = .92,  $F(3,460)=14.16$ ,  $p<.001$ ). There was an interaction effect for gender with experimental condition, but no interaction effect for perceptions of extrinsic with intrinsic goal content, or of goal content with perceived autonomy-support. The outcomes of the ANCOVA for each need are presented in Table 7.8. There was a significant main effect of experimental condition on reported autonomy satisfaction, as in line with the hypotheses (accounting for 22% of the variance explained by the model) participants in both autonomy-supportive conditions (1 and 3) reported greater satisfaction of the need for autonomy than other groups, regardless of goal

**Table 7.8 Model statistics for need satisfaction**

$R^2$ $F$ (df)			Significant predictors in Model 2	Beta weights (parameter estimates)
Model 1	Model 2	Model 3		
<b>Autonomy</b>				
$R^2=.38$	$R^2=.53$	$R^2=.37$	Baseline contextual autonomy	.18***
$F(11, 467)$	$F(14, 464)$	$F(4, 474)$	Perceived intrinsic goal content	.23***
=26.40	=37.60	=70.06	Perceived autonomy-support	.38***
$p<.001$	$p<.001$	$p<.001$	Connectedness	.10*
			Experimental condition	1.43***
			$F(4,464)=42.58$ , $p<.001$	condition 1
				condition 2
				condition 3
				condition 4
				.12
				1.67***
				.20
<b>Competence</b>				
$R^2=.27$	$R^2=.41$	$R^2=.38$	Baseline contextual competence	.36***
$F(11, 467)$	$F(13, 465)$	$F(6, 472)$	Perceived intrinsic goal content	.34***
=16.03	=22.91	=48.66	Experimental condition	NS
$p<.001$	$p<.001$	$p<.001$	Gender interaction	.95**
			condition: 1	.60*
			condition: 3	
<b>Relatedness</b>				
$R^2=.22$	$R^2=.33$	$R^2=.31$	Baseline contextual relatedness	.27***
$F(11, 467)$	$F(13, 465)$	$F(6, 472)$	Perceived intrinsic goal content	.24***
=11.59	=16.19	=34.69	Perceived autonomy-support	.24***
$p<.001$	$p<.001$	$p<.001$	Gender	-.87**
			Experimental condition	NS
			Gender interaction	.99**
			condition: 1	.80*
			condition: 2	.81*
			condition: 3	

Note: \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$ , NS $>.05$

content rationale. Within groups, higher perceptions of an intrinsic goal focus, greater perceived autonomy-support, and greater school connectedness all had an additional positive effect on satisfaction of autonomy.

Satisfaction of the needs for competence and relatedness were not influenced by the main effect of experimental condition (group level effects accounted for only 4%, and 3% of the variance in the outcomes of competence and relatedness respectively), but differed as a result of the interaction between gender and condition. Girls reported greater perceived competence relative to baseline when taking part in either of the autonomy-supportive conditions (conditions 1 and 3) than did boys, and also greater perceptions of relatedness than boys in all conditions except for condition 4 (controlling, extrinsic goal rationale). Competence was significantly predicted by perceptions of an intrinsic goal focus, but not by perceptions of autonomy-support. Variance in relatedness was explained by the main effect of gender, which was lesser in boys following the lesson than in girls. Relatedness was also positively enhanced by perceptions of both an intrinsic goal focus and autonomy-support. Contrary to the hypotheses, there was no negative effect of an extrinsic goal focus.

### **7.3.3.2 Motivation**

The greatest proportion of the variance in motivational outcomes was also explained by Model 2 (Wilk's Lambda=.81,  $F(5,457)=20.95$ ,  $p<.001$ ), however, the results of post hoc tests relating to the impact of randomisation group should be interpreted with caution, given that there was no difference at all in the explanatory power of models 2 and 3 for introjected, identified and intrinsic regulations (Table 7.9).

The effect of experimental condition was significant for amotivation, external regulation, and intrinsic motivation. The findings were contrary to the hypotheses. Amotivation was reduced rather than increased in controlling and/or extrinsic goal conditions (lower in groups 2, 3 and 4), and external regulation was greater in all experimental conditions over the control group indicating that the same outcome resulted from the presentation of an intrinsic or extrinsic goal rationale. Intrinsic regulation showed significant variation between groups, but no consistent effect in line with the experimental manipulations (i.e., group differences varied within both autonomy-support and goal content conditions). However the between-group effects only account for between two and five percent of the variance explained by the model, and therefore are of limited importance in comparison with individual level effects.

The strongest predictors of self-determined motivation were perceived intrinsic goal content, and autonomy-support. Identified and introjected regulations are of particular

interest as they are the forms of motivation implicated in the process of internalization. Although neither regulation was influenced by the main effect of experimental condition, both regulations were positively and independently predicted by perceived autonomy-support and perceptions of an intrinsic goal focus. Thus, in line with the theoretical predictions of SDT and the research hypotheses, these findings indicate not only that internalization may be promoted through enhanced perceptions of autonomy-support, but

**Table 7.9 Effect of experimental groups on motivation**

$R^2$ F (df)			Significant predictors in Model 2	Beta weights (parameter estimates)
Model 1	Model 2	Model 3		
<b>Amotivation</b>				
.15 F(10,468) =13.91 p<.001	.24 F(9, 469) =16.26 p<.001	.21 F(4, 474) =31.23 p<.001	Perceived intrinsic goal content Perceived autonomy-support Baseline amotivation Experimental condition	-.29*** -.14** .67*** .02
			condition 1 condition 2 condition 3 condition 4	-.26 -.47* -.56**
<b>External regulation</b>				
.16 F(10,468) =9.00 p<.001	.18 F(13, 465) =7.67 p<.001	.13 F(5, 473) =14.28 p<.001	Perceived autonomy-support Baseline external regulation gender Experimental condition	-.16** .32*** -.13* -.48
			condition 1 condition 2 condition 3 condition 4 Gender interaction	-.11 -1.32*** -.47 1.08
<b>Introjected regulation</b>				
.21 F(7, 471) =17.36 p<.001	.40 F(10, 468) =30.53 p<.001	.39 F(4, 474) =75.55 p<.001	Perceived intrinsic goal content Perceived autonomy-support Baseline introjected regulation Experimental condition	.33*** .31*** .38*** NS
<b>Identified regulation</b>				
.20 F(7, 471) =16.30 p<.001	.54 F(10, 468) =55.35 p<.001	.54 F(4, 474) =137.34 p<.001	Perceived intrinsic goal content Perceived extrinsic goal content Perceived autonomy-support Baseline identified regulation Experimental condition	.45***/.40*** .08*/.08* .38***/.32*** .18***/.18*** NS/-
<b>Intrinsic regulation</b>				
.15 F(7, 471) =16.37 p<.001	.49 F(9, 469) =49.61 p<.001	.48 F(4, 474) =107.59 p<.001	Perceived intrinsic goal content Perceived autonomy-support Baseline intrinsic regulation Experimental condition	.43*** .40*** .22*** -.25
			condition 1 condition 2 condition 3 condition 4	.07 -.34* -.001

Note: \*p<.05, \*\*p<.01, \*\*\*p<.001, NS =p>.05



in addition, that there is an independent effect of intrinsic goal content. However, contrary to the hypotheses, extrinsic goal content had a small but positive effect on all forms of motivation (and a negative effect on amotivation), and was significant (but small;  $\beta = .08$  versus  $\beta = .45$  for intrinsic goal content) for identified regulation. This was contrary to the hypothesis that predicted that a focus on extrinsic goals could compromise motivation. These findings indicated that the presentation of any rationale, regardless of content, appeared advantageous in motivating students towards taking part in the lesson.

There was a significant gender effect for external regulations only. Girls were less likely than boys to report taking part in the lesson due to external regulation, and an interaction effect indicated that this was significantly stronger in condition 3 (autonomy-supportive, extrinsic goal rationale). There was no gender difference in contextual external regulation at baseline, and therefore this finding suggests that the girls were responding differently to boys to all lesson conditions, in that boys were more likely to perceive that they were taking part just through doing as they were told. The implications of this result however should not be interpreted in isolation of gender differences in more self-determined forms of motivation, as this may purely reflect greater motivation of all forms in boys (Table 7.2).

### **7.3.3.3 Value**

Model 2 explained 48% of the variance in the degree to which a person perceived value in the lesson, for which there was a small but significant main effect of experimental condition (4% of the variance explained). Participants in condition 4 (controlling, extrinsic goal rationale) perceived significantly more value in the lesson than participants in other groups. At an individual level, greater value was predicted by higher perceptions of intrinsic goal content, perceived autonomy-support, and higher baseline levels of contextual self-determined motivation towards PE. The individual and group level outcomes for goal content in this analysis are consistent, as although participants in condition 4 were exposed to the extrinsic goal content manipulation, they reported the highest ratings of perceived intrinsic goal focus of all groups. Therefore, consistent with SDT, greater value was perceived in conditions which had a strong focus towards intrinsic goals (Table 7.10), but contrary to the hypotheses, there was no negative effect of perceptions of extrinsic goals.

It was of additional interest, that despite individual level positive associates with perceived autonomy-support, participants in conditions 1 and 3, the autonomy-supportive conditions, reported less value than the control group. This may indicate that some aspect of the experience of the way in which the autonomy-supportive lessons were conducted independent of perceived autonomy-support, may have had the effect of decreasing the perceived value of the activity.

**Table 7.10 Experimental condition effects on perceived value of the lesson**

$R^2$ $F$ (df)			Significant predictors in Model 2	Beta weights (parameter estimates)
Model 1	Model 2	Model 3		
<b>Perceived lesson value</b>				
.19	.48	.46	Perceived intrinsic goal content	.53***
$F(11,467)$	$F(14, 464)$	$F(5, 473)$	Perceived autonomy-support	.32***
=10.08	=31.00	=81.25	Contextual motivation	.02***
$p<.001$	$p<.001$	$p<.001$	Experimental condition	
			condition 1	-.22
			$F(4,464)=4.53, p<.05$	
			condition 2	.13
			condition 3	-.02
			condition 4	.47*

Note: \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

### 7.3.3.4 Behavioural and affective outcomes

Once again, for all behavioural and affective outcomes (except for change in well-being which was not significantly predicted by any model) the greatest explanatory power was provided by Model 2. Self-reported effort during the intervention lesson was predicted by the main effect of experimental condition, and by the interaction of condition with gender. Group effects explained 8% of the total variance in effort explained by the model (i.e., 8% of 38%). Participants in condition 1 (autonomy-supportive, standard rationale) reported contributing significantly less effort, whereas participants in condition 2 (controlling, standard rationale) contributed significantly more effort than the sample mean. The pattern of non-significant effects mirrored these results to suggest that in a PE context more effort is associated with a greater control from teachers in the short term (Table 7.11). This finding is contrary to the initial hypotheses, however it is consistent with the pattern of responses for value. Individual level effects however were consistent with the hypotheses, as greater effort was associated with higher perceptions of intrinsic goal content, greater perceived autonomy-support, more self-determined motivation for PE, and greater school connectedness.

There was no main effect of experimental condition on the outcome of enjoyment. This is contrary to hypotheses and the tenets of SDT which expect that although behaviour may be promoted in the short-term by controlling environments or forms of motivation, it will be associated with poorer affect (Deci et al., 1994). Thus, the greater effort and value reported in conditions 2 and 4 were not accompanied by an expected reduction in enjoyment and interest. Enjoyment was predicted at the individual level by intrinsic goal focus, autonomy-support, greater school connectedness and greater contextual self-determined motivation for PE. These relationships were all in the directions hypothesised. None of the three models were significant for predicting changes in well-being. This

indicated that either well-being was not affected by autonomy-support and goal content, or by the experience of exercise incorporated in the PE lesson as a whole, or that the measure used was not sufficiently sensitive to change over this period.

**Table 7.11 Effect of experimental outcome on effort, intention to repeat, and enjoyment**

$R^2$		Significant predictors in Model 2		Beta weights (parameter estimates)
Model 1	Model 2	Model 2		
<b>Self-reported effort</b>				
.22	.36	.30	Perceived intrinsic goal content	.34***
$F(11,467)$	$F(14,464)$	$F(6,472)$	Perceived autonomy-support	.14***
=11.90	=18.23	=33.58	Contextual motivation	.02***
$p<.001$	$p<.001$	$p<.001$	Connectedness	.13**
			Experimental condition	
			condition 1	-.45*
			condition 2	.47*
			condition 3	-.40
			condition 4	.31
			Gender interaction	
			condition 1	.89*
<b>Intention to repeat</b>				
.13	.33	.29	Perceived intrinsic goal content	.40***
$F(6,411)$	$F(9,408)$	$F(4,413)$	Perceived autonomy-support	.38***
=10.25	=22.58	=42.81	Contextual motivation	.02*
$p<.001$	$p<.001$	$p<.001$	Experimental condition	
			condition 1	-.32
			condition 2	.41
			condition 3	-.31
			condition 4	.47
<b>Enjoyment and interest</b>				
.18	.44	.43	Perceived intrinsic goal content	.34***
$F(6,472)$	$F(9,469)$	$F(5, 473)$	Perceived autonomy-support	.33***
=17.50	=40.24	=70.97	Contextual motivation	.02***
$p<.001$	$p<.001$	$p<.001$	Connectedness	.10*
			Experimental condition	NS

\* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

The final outcome to be assessed was students' intentions to join a similar circuits class in their free time (Model 2:  $R^2=.33$ ,  $F(9,408)=22.58$ ,  $p<.001$ ). The main effect of experimental group was significant, showing a trend for participants in controlling conditions to report a greater intention to take part in future than those in autonomy-supportive conditions. However, the individual level variables reported contrary effects, as intentions were positive predicted by greater perceived intrinsic goal focus, perceived autonomy-support and higher baseline self-determined contextual motivation for PE, in line with the research hypotheses.

### 7.3.4 *Synthesis of Results*

There was support for the first hypothesis at an individual level, but not as a result of the main effect of the intervention. Participants in autonomy-supportive classes represented by conditions 1 and 3 reported very few advantages over those in controlling lessons. Situational autonomy was enhanced, and external regulation marginally reduced. In fact many outcomes were poorer in these conditions than for those in controlling conditions (e.g., intrinsic regulation, value, effort and intention). However, as the effect of the manipulations at the group level accounted for below 10% of the variance in all outcomes except for need satisfaction, greater weight is attributed to the results obtained at an individual level. Reasons for the discrepancy will be addressed in the discussion section. Based on individual level variables, the first hypothesis was supported as autonomy-support was facilitative of positive outcomes in all cases. As such, the lack of impact of the main effect may instead suggest little additive effect of the presence of a rationale and acknowledgement.

The second hypothesis predicted that a controlling climate would result in poorer outcomes than the control group, as it would compromise the positive benefits of the provision of a rationale for goal directed behaviour. This hypothesis was not supported at the group level, as participants in controlling conditions appeared to be motivated into action by their lessons, increasing their effort, increasing the value they perceived in the lesson, while having no negative effect on their level of enjoyment. As no explicit measure of the perceived controlling nature of the lessons was recorded, no comparison can be made of the individual level effects.

The fourth hypothesis<sup>12</sup> suggested that extrinsic goals would have a negative impact on internalization and other outcomes. Again, in response to the experimental manipulations (i.e., the outcomes of groups 1, 2 and 5 versus groups 3 and 4) the only significant effects of extrinsic goal content were a positive (i.e., attenuative) effect on amotivation, and a marginally beneficial (again, attenuative) effect on external regulation. These findings suggest that the extrinsic goal presented to students was perceived to be a meaningful goal for taking part in PE, reflected by associated increases in value and effort in these same groups. At the individual level, perceived extrinsic goal content was a significant positive predictor of identified regulation, and it had a positive, although non-significant association with all other variables. While the magnitude of the significant association was sufficiently small ( $\beta=.08$ ) to suggest it may not have a meaningful additional effect to

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<sup>12</sup> The third hypothesis was not tested as the experimental manipulation for intrinsic goal content was not successful.

intrinsic goal content ( $\beta = .45$ ), the results do support a lack of a negative effect of extrinsic goals. Therefore the third hypothesis was not supported by the present data.

## 7.4 Discussion

The purpose of the present study was to assess whether students' goals for a single PE lesson could be manipulated through a brief introductory statement (framing the lesson either as a means to attain the intrinsic goals of health and fitness, or the extrinsic goals of weight control and appearance), and to evaluate the outcomes of goal framing. Whereas previous studies have reported on the utility of goal content and autonomy-support in the adoption of new behaviours (e.g., Sheldon et al., 2004; Vansteenkiste et al., 2004a), the present study was designed to provide a test of these relationships within the ecologically valid setting of an existing, mainstream exercise context (i.e., school PE classes).

In line with the hypotheses, the present study reported that adolescents' affective, behavioural and motivational responses to a single PE lesson were positively predicted by perceptions of autonomy-support, and a focus on intrinsic goals (i.e., health and fitness). Contrary to the hypothesis, a focus on extrinsic goals (i.e., physical appearance to others) was associated with a small but positive effect on study outcomes. Thus, providing a rationale for the lesson had a positive effect on student extrinsic motivation (i.e., it promoted or supported internalization) relative to those who received no explanation of why the lesson was important, and this effect was observed whether the rationale emphasised either intrinsic or extrinsic goals. SDT predicts that focusing on separable outcomes can compromise intrinsic motivation (Deci, 1972; Deci & Ryan, 1985a). Consistent with such reasoning, in the present study presenting a goal directed rationale had a small but negative impact on intrinsic motivation. In a further unexpected finding, participants in controlling experimental conditions reported contributing greater effort, perceiving greater value of the lesson and reporting greater intentions to take part in future than participants in autonomy-supportive conditions, at no detriment to enjoyment or well-being. This contrasted with individual level findings, which reported the expected positive effects of autonomy-support. The results therefore suggest that positive group level effects of controlling classes may have reflected an artefact of the lesson format such as clearer lesson structure or consistency with expectations of autonomy-support for a PE class. Whatever their source, the effect of experimental manipulations had a far lesser influence on outcomes than individual perceptions of the lesson climate.

The lack of strong inter-class correlations, and potential mismatch between the provision of autonomy-support and the degree of control that students appear to want, contribute to the assumption that the main examination of effects in answering the research

hypotheses should be from the data provided at an individual level. At this level, independent positive effects were reported for intrinsic goal content and autonomy-support consistent with past work (Sheldon et al., 2004; Vansteenkiste et al., 2004a). However, contrary to previous research (Sheldon et al., 2004; Vansteenkiste et al., 2004a) the expected negative effect of extrinsic goal content on lesson outcomes was not found. Although non-significant in all but one case (identified regulation), perceptions of extrinsic goal content were associated with positive rather than negative outcomes. There was also no interaction effect between intrinsic and extrinsic goal content on any of the outcomes, confirming that extrinsic goal content did not compromise the positive effects of intrinsic goals. The independent significant effect of extrinsic goals on identified regulation suggests that perceiving an extrinsic goal focus can have an additional contribution to the internalization of behaviour, albeit to a small degree ( $\beta = .08$ ). This is perhaps no surprise, as the particular extrinsic goal chosen for the present study, physical appearance, represents a personal attribute that adolescents value highly (Furnham et al., 2002; Smith, 2003), and which would thus be expected to be perceived as personally meaningful. Certainly all experimental groups in which either an intrinsic or extrinsic rationale was presented were associated with lesser amotivation than the control group, which would support the suggestion that having any goal for an activity, whether intrinsic or extrinsic may be sufficient to activate behaviour.

While contrary to theory outlined by SDT (Deci et al, 1994) these findings are not completely in opposition to previous research (Sheldon et al., 2004; Vansteenkiste et al., 2004b). For example, Vansteenkiste and colleagues reported better persistence up to four months for school children learning a new sport following extrinsic goal framing relative to no goal framing, although as in the present study, the outcomes were not as positive as for those oriented towards intrinsic goals. The present study differed from this research in that it attempted to manipulate goals for an existing activity, and as such had to work in an environment in which existing goals were present. Therefore, while previous work provides a comparative test of the two forms of goal content, the present study provides a more ecologically valid example of the effects of manipulating goals within the constraints of an everyday setting. Findings from both design approaches concur that striving for extrinsic goals results in poorer outcomes than for intrinsic goals, but that they are still positive relative to no goal. However, there is no existing empirical evidence that extrinsic goal content alone would be sufficient to sustain behaviour.

In the present study, while it appeared that extrinsic goal content was increased through the experimental manipulation, no effect was brought about on intrinsic goal content. This may have been a result of working in a naturally occurring setting, attempting to change rather than create goals for an activity. Only 4% of students reported strong weight and

appearance-related goals for PE at baseline, whereas strong health and fitness goals were reported by 32% of the sample. Thus, the difference between the impact of the lesson manipulations may reflect the novelty of the goal presented. Participants in the control condition, who were not provided with any reason as to why they should take part in the lesson reported an equivalent health and fitness focus for the lesson than the participants for whom this goal was explicitly emphasised. Similarly, participants in the extrinsic goal content groups reported equally strong perceptions of intrinsic goal focus to that of other groups. This finding indicated that health and fitness provided a form of default goal for PE, which was neither enhanced through additional emphasis nor reduced by the addition of other goals. This is consistent with comments from same age students interviewed in the previous study (Chapter 6), who were well aware that regardless of alternative goals they may have for physical activity their participation in exercise would result in the welcome effect of improving their health and fitness. Overall, in terms of considering to what extent goal content is malleable to intervention, the current study confirms the achievements of previous research in having oriented individuals towards new goals, but through this approach alone it did not have an impact on lessening the strength of existing goals as a result.

Given current Government concerns at the deterioration in adolescent exercise levels for girls in particular (DoH, 2004) it is pertinent to assess the results in relation to gender differences. There were few outcomes for which gender had a significant impact. This was consistent with SDT which suggests that despite differences in mean levels of attributes, responses to similar social environments should be largely universal (Deci & Ryan, 1985), and is supported by previous research which has tested the invariance of relationships between the social environment and exercise across gender (Ntoumanis, 2001; Standage et al., 2005a). In the present study, gender, or the gender-experimental condition interaction had a significant impact only on competence, relatedness and external regulation. Adolescent girls experienced a greater increase in competence relative to baseline in autonomy-supportive conditions, than they did in controlling conditions. This may suggest that girls' perceptions of their own competence are less stable than boys', and may help to explain differences in their levels of participation in LTE discussed in other chapters. Girls also reported better need satisfaction for relatedness in conditions 1, 2 and 3, suggesting that their social relationships were improved by autonomy-supportive lessons and climates that avoid an emphasis on extrinsic goals to a greater degree than for boys. Finally, girls reported lower external motivation relative to baseline in all conditions than did boys, except for condition 3 (autonomy-supportive, extrinsic goal rationale). This could suggest that girls were either less willing to do as they were told (i.e., they resisted external regulation, perhaps reflected in lower participation rates), or had greater appreciation of the lesson aims which made them more likely to

partially internalise their motivation. However, this was not reflected by significantly greater outcomes for introjected or identified regulation which would be expected in this case. Alternatively, it may be an effect of boys' higher reports of self-determined regulation at baseline, rendering them more sensitive to the constraints imposed by the PE lesson, compromising their self-determined motivation. As these findings were all reported at the group level which held very little explanatory power, they should be interpreted with caution. However, they do serve to emphasise the need to recognise gender difference in exercise settings which may be important in decreasing the activity gap between boys and girls at this age.

#### **7.4.1            *Limitations and future directions***

The first limitation of the present study stems from the failure to achieve a significant manipulation of the intrinsic goal content condition. Having an intrinsic goal focus for taking part had an additional independent positive effect, but this was found to be as a result of pre-existing goal content, rather than brought about through the experimental manipulations. This is likely to be due to a number of reasons, not least that by the age of 13 to 14, adolescents are clearly well aware of the reason that they are required to take part in PE. While the lesson content (an exercise circuits class) was chosen as it is commonly considered to be less interesting than other PE lessons by adolescents of this age, which is necessary to show evidence of internalization rather than engagement for intrinsic motivation, it was found to be a problematic format as it overemphasised health and fitness goals to all students regardless of the information provided by the researcher. Thus, the very nature of the intervention PE class confounded the experimental manipulation. Although this may have been avoided through using a novel form of exercise, as has been conducted in past research (e.g., Sheldon et al., 2004; Vansteenkiste et al., 2004b), it was considered important to apply a goal theory approach to a real world setting where it may be that key to maintaining activity during adolescence and on into adulthood, lies in helping individuals to find value in the activities that are already available to them.

As differences were expected at a class, rather than at an individual level, only perceptions of the intended focus of the lesson rather than goal content itself was measured. This limited the interpretation of results as it did not measure whether participants endorsed the perceived lesson focus to take part with that goal in mind themselves. Previous experimental studies have been similarly restricted by the lack of sensitive measures, and recent experimental studies have tended not to explicitly record goal content, inferring goal content orientation instead from the provision of an experimental manipulation (Vansteenkiste et al., 2004a; Vansteenkiste et al., 2004b). Observational studies have used a free response format (e.g., Sheldon et al., 2004). In



the pilot to the present study, participants typically nominated non-specific multiple goals including health, weight control and to have fun, which were more indicative of all possible outcomes that they could envisage for PE, rather than their specific goal for that lesson. These responses provided little information regarding the relative salience or strength of each goal, and would not necessarily be expected to change as a result of the lesson manipulation. Therefore, a useful next step would be the development of a situational goal content measure for use with adolescents. Care would be needed in designing instructions that will be perceived by participants to be asking the question of exactly what they want to get out of participating in this activity on this occasion (i.e., a situational goal), and isolating this from both their wider aims for participating in physical activity, or from the other associated benefits such as fitness, that are welcomed and valued, but are not primary drives to participation. The accurate measurement of an adolescent's goals would allow greater analysis of the degree to which goal content can be changed by lesson scripts, rather than relying on the inference that perceiving what a teacher intends is sufficient to determine why the student takes part.

In each analysis, three models were compared to assess the relative explanatory power of analyses conducted at the group-level only, individual-level only, or a combination of the two. In all cases the model containing both group and individual level effects (Model 2) was found to have the greatest explanatory power. It is therefore possible that more variance was predicted simply as more independent variables were included. However, this approach was retained as it was considered that an exploratory approach would be preferable to restricting the analysis to a model which may exclude potentially important predictors. As was seen in the results, experimental condition was significantly predictive of seven of the twelve outcomes, even if the size of the effect was small (i.e., <10% of the variance). Given the limitations discussed with respect to the manipulation of experimental conditions which could suggest that the differentiation between groups was not as strong as in previous research, these effects may yet be important in informing future work.

A final limitation relates to the extent to which the present study can recommend action from teachers, coaches or parents to promote autonomy-support and intrinsic goals, given that the group level effects of the present study did not explain even 10% of the variance in student behavioural, affective and cognitive outcomes. Similarly limited class level effects have been reported in previous research attempting to manipulate mastery climates in youth athletes nested within teams (Smith et al., 2007) or school PE lessons (Papaioannou et al., 2004). While these highly individualistic findings are supported by the tenets of SDT that affirm that it is the perception of the environment rather than objective factors such as teacher style which is important for outcomes (Deci & Ryan,

1985a; Ryan & Deci, 2002), the lack of a group effect is problematic for suggesting future approaches for intervention as it suggests that class level approaches may be limited in their efficacy. Thus, while it can be concluded that autonomy-supportive climates and intrinsic goals have positive implications for engagement in PE, enjoyment, and intentions to get involved in similar activities in future, this may not be significantly influenced by individual lesson framing. However, part of this limitation may stem from the fact that the present study monitored the effects only of a single lesson. Longitudinal work would be useful in establishing whether extrinsic goals would continue to have such a benign effect if they were emphasised during PE throughout a whole school year for example, and similarly to explore the stability of goals between PE lessons. Taking a more positive approach, it would also be useful to investigate how the high perceptions of intrinsic goal content for PE were established in the adolescents within these studies. This may well be as a result of repeated emphasis of intrinsic goals by teachers, which has brought about a persistent and stable intrinsic goal focus that is resistant to potential undermining effects of extrinsic goal content over the short-term.

The present study is also restricted to commenting on the impact of extrinsic goals when held in combination with intrinsic goals. In this case the generally held goal for PE was reported to be intrinsic, and therefore counteracting these in order to promote adaptive outcomes would not be desirable. According to SDT (Deci & Ryan, 2000), extrinsic goals would not be expected to underpin long-term engagement in behaviour. However in school settings where participation in PE is not optional and therefore cessation of the activity is not possible, there may be subgroups of students who are primarily motivated by extrinsic goals. Given that the findings of the present study suggest that introduction of new goals is not sufficient to reduce existing goals, further interesting work could investigate means of re-orienting individuals from extrinsic to intrinsic goals in cases where this may appear useful.

## **7.5 Conclusions**

For each of the outcomes analysed in the present study, perceiving autonomy-support for students during PE lessons showed beneficial effects as predicted by SDT (Deci & Ryan, 1985a). Consistent with SDT (Deci & Ryan, 2000), taking part for intrinsic goals had an additional independent positive effect but this was found to be as a result of pre-existing goal content, rather than an effect of the experimental manipulations. The intervention introduced a novel extrinsic goal (only 4% of students reported weight and/or appearance goals in the present sample prior to the intervention) which resulted in greater perceived lesson value and reported effort at the group level. Contrary to the study hypotheses, and established SDT theory, extrinsic goals also had a significant positive effect on identified regulation, suggesting that the goals of exercising for weight control and physical

appearance may be initially helpful in engaging students in an uninteresting PE lesson. However, as the positive effects on identified regulation were significant but small, and its associations with other outcomes were positive but non-significant, it is perhaps more accurate to conceptualise extrinsic goals as harmless to intrinsic motives and goals, rather than necessarily of additional benefit. While this finding appears to be contrary to goal content theory (Deci & Ryan, 2000), an explanation may stem from the fact that extrinsic goals co-occurred with equally strong intrinsic goals in the present sample ( $r=.59$ ,  $p<.001$ ).

The outcomes of the present study raise some interesting new directions for research, and emphasise the importance of exploring the effects of goal content and autonomy-support in naturalistic settings. Previous work has identified school PE as a setting from which to promote wider exercise participation to adolescents (e.g., Sharma, 2006). If student engagement in PE is therefore to be enhanced, it is necessary to investigate ways of doing so which work with the existing baseline of intrinsic goal content. The task of increasing goal driven behaviour is not as simple as reinforcing existing intrinsic goals, as the present study demonstrates that this brought about no additional beneficial effect. Building on the present study, future work would be useful in assessing the effect of promoting different intrinsic goals (i.e., other than health and fitness) which may be novel to students within the PE setting, and which may therefore have potential to lead to additional benefits. While the positive (or lack of negative) findings for extrinsic goal content could be explained to some extent by the presence of accompanying intrinsic goals, it is important that the current findings are not prematurely dismissed purely as they contrast with SDT. The positive effect of extrinsic goals is consistent with the results from the interviews reported in Chapter 6, which found that in a group of highly active adolescents, extrinsic exercise goals coexisted with intrinsic goals, and both were considered to be important motivators by the adolescents themselves. Within the interview sample, appearance-related extrinsic goals appeared to serve a function of maintaining behaviour through a different route than that presented by intrinsic goals, in that they provided a deterrent to dropping out of exercise. This function perhaps helps to maintain an individual's involvement in their usual activities even on days they do not feel inclined to take part for more self-determined reasons. As such, extrinsic goals may have had an adaptive impact on maintaining behaviour. However, a more exact measure of exercise goal content and longer term studies to track the effect of extrinsic goals over time would be necessary to investigate these possibilities further.



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## Discussion

In the current climate of rising levels of adolescent obesity and declining levels of physical activity, the four studies included in this thesis were designed to contribute to our understanding of why participation in leisure-time exercise declines during adolescence. In particular, the studies aimed to test a proposed pathway of effects between negative body or weight-related physical self-perceptions (WR-PSPs) and engagement in volitional exercise through the application of self-determination theory (SDT). The roles of extrinsic goal content, need satisfaction and motivation on LTE were tested at both a cross-sectional and longitudinal level, and analysed in detail through a qualitative study. A final experimental study was then conducted to test the degree to which some of these observed constructs are open to change, and to explore whether focusing adolescents on exercising for goals of physical appearance in a single exercise session (PE) would be facilitative of involvement in PE through heightening its relevance, or inhibitive of self-determined motivation through the pathway of effects predicted for extrinsic goals by SDT (Deci & Ryan, 2000).

The effect of these proposed pathways on QoL was also measured. This provided an assessment of the impact of hypothesised effects on a global psychosocial outcome in addition to the contextual outcome of LTE, and also provided a means of assessing the relative importance of the different domains of life and potential changes during the period of adolescence studied. This final chapter aims to draw together the main findings of all four studies on the outcomes of both QoL and LTE to consider the degree to which they might promote our understanding of the relationships explored, and to consider their practical applications and possible directions for future research.

### 8.1 Summary of findings

#### 8.1.1 *The Effects of Weight-Related Physical Self-Perceptions*

Studies 2 and 3 explored the relationship between WR-PSPs and extrinsic goals for exercise as they relate to LTE and QoL in a cohort of UK adolescents. At a cross-sectional level, support was found for the premise that considering oneself to be overweight, and perceiving pressure from others to lose weight was positively linked to both the experience of social physique anxiety (SPA), and to extrinsic goals for exercise (i.e., to improve appearance and control weight). SPA was also directly positively associated with extrinsic goals. In line with previous research grounded in SDT, the negative impact that extrinsic goals had on the ultimate outcomes of LTE and QoL was

mediated through their negative effect on motivation (Sheldon et al., 2004; Vansteenkiste et al., 2004a), indicating that extrinsic goal content compromises adaptive outcomes by focusing individuals away from need satisfying activities (Deci & Ryan, 2000). When the relationships were tested over the longer term, the negative impact of extrinsic goal content on the outcomes of LTE and QoL was no longer evident. However, the negative relationship from WR-PSPs (namely body satisfaction and SPA) mediated through need satisfaction and motivation persisted.

The finding of a stronger effect on outcomes brought about by WR-PSPs than that resulting purely from the formation of extrinsic goals is consistent with a large body of research. Previous work has observed that while adolescents experiencing poor physical self-perceptions do engage in goal driven behaviour to attempt to rectify the cause of their dissatisfaction (i.e., act in ways they believe will result in them losing weight), exercise is rarely among the means that they employ (Boutelle et al., 2002; Neumark-Sztainer et al., 2006). Instead, WR-PSPs are more likely to be associated with behavioural outcomes such as dietary restraint, and maladaptive weight-loss techniques (Ricardelli et al., 2000; McCabe et al., 2003). However, the psychosocial constructs proposed by SDT still contribute significantly to explaining the relationship between WR-PSPs and LTE, as both the cross-sectional and longitudinal results converge to suggest that WR-PSPs (specifically, body satisfaction and SPA) have a significant direct impact on need satisfaction and motivation. In the longitudinal analysis of study 2, body satisfaction was positively associated, and SPA negatively associated with all three needs, which in turn predicted drop-out from, or adoption of LTE over the following year. The relationship between WR-PSPs and LTE was most strongly mediated by their effect on motivation. Body dissatisfaction and SPA were predictive of greater external regulations for exercise (i.e., exercising as a result of contingencies enforced by others), and undermined self-determined forms of regulation (i.e., identified and intrinsic). Thus, it appears that the power of WR-PSPs to compromise exercise levels was only partially as a result of its effect of increasing extrinsic goal content. Furthermore, WR-PSPs showed no association with intrinsic goal content (e.g., enjoyment, socialising) indicating that intrinsic goals are robust to the undermining effects of negative WR-PSPs.

### **8.1.2 Resilience to controlling motivation and extrinsic goals for exercise**

One way in which all three of the main studies in this thesis diverged from theory was in the degree of resilience adolescents showed in maintaining positive exercise and QoL outcomes in the presence of controlling (primarily introjected) forms of motivation and extrinsic goal content. This was in direct opposition to the predictions of SDT (Deci & Ryan, 2000; Ryan & Deci, 2002). In study 4, the orientation of a PE lesson was successfully manipulated to increase students' perceptions of the extrinsic goal focus of

improving appearance to others. In line with expectations that appearance-related goals would be important to adolescents (Craft et al., 2003; Sabiston et al., 2007) focusing on these extrinsic goals resulted in greater perceived value of the lesson. However, far from compromising effort and enjoyment as is predicted by SDT (Deci & Ryan, 2000; Vansteenkiste et al., 2004b), the emphasis on extrinsic goals also marginally *improved* effort and enjoyment for participants. This departs from previous research which reports that when new tasks are learnt in response to extrinsic goal framing they result in significantly poorer motivational, persistence and performance than both intrinsic goal framing or no-goal framing control groups (Deci et al., 1994; Vansteenkiste et al., 2004b). Such outcomes are hypothesised to result from the compromise of need satisfaction, and increased likelihood that extrinsic goals are derived from extrinsic forms of motivation (Deci & Ryan, 2000).

An insight into why this departure from previous work may have occurred is suggested by the one study to report a benefit, however limited, for extrinsic goal content (Vansteenkiste et al., 2004a). In a learning task, Vansteenkiste and colleagues reported that extrinsic goals were associated with better superficial cognitive processing, and as a result better short term recall than intrinsic goals. Intrinsic goals were still superior in quality in that they were associated with deeper processing and indicative of better long term learning in line with SDT, but the positive finding for extrinsic goals indicates that their pursuit can result in the successful deployment of effort towards some outcomes, but that the type of learning it promoted was qualitatively different from that promoted by intrinsic goals (Vansteenkiste et al., 2004a). Bearing in mind that in study 4 of the present thesis none of the experimental manipulations had the effect of reducing students' inherent intrinsic goals for exercise, the impact of extrinsic goal content was only assessed in the presence of equally high intrinsic goal content. If Vansteenkiste and colleagues are correct in suggesting that intrinsic and extrinsic goals trigger qualitatively different behaviours that both contribute to task attainment, this could suggest that the positive finding for extrinsic goals in study 4 resulted from the cumulative effect of both extrinsic and intrinsic goal directed behaviour. Thus, far from compromising the benefits of intrinsic goals, extrinsic goals could contribute an additional "booster" effect. Further work would be useful in exploring whether this additive effect is replicated in this and other settings, and if so suggests an exciting direction for applied research exploring which extrinsic goals may be employed to enhance important behavioural outcomes.

Similar positive effects, diverting from SDT, were also found across studies for introjected regulation. Theoretically, introjected regulation is considered to be a controlling form of motivation, and while it is associated with the uptake of behaviour in the short term through the early stages of behavioural internalization (Deci et al., 1994), it has been

concurrently associated with poorer affect and well-being in previous research (e.g., Hamer et al., 2002; Thøgersen-Ntoumani & Ntoumanis, 2006). As such, the finding that introjected regulation was predictive of both behavioural engagement *and* good QoL over one year follow-up were contrary to expectations. Study 3 was primarily designed to provide insight into the observed inconsistency between the present findings and previous work, and provides some insight into the possible basis for the tolerance of extrinsic goals and controlling forms of motivation shown by study participants.

Firstly, it was of note that adolescents reported having different goals and motivation for different types of activity. Thus, just as the effects of extrinsic goal content were not reported in isolation from the existence of intrinsic goal content in study 4, introjected regulation of exercise did not occur in isolation from more self-determined forms of regulation. For example, one subgroup of participants reported that their participation in sporting activities was driven by intrinsic goals and intrinsic motivation, whereas their engagement in fitness-related exercise training was largely driven by introjected motivation and extrinsic goals. In this case involvement in both forms of exercise was ultimately driven by intrinsic motivation to take part in a sport or physical activity that was enjoyed. The training activities undertaken for introjected reasons were recognised as necessary steps to achieving their overarching intrinsic aim (i.e., the need to keep fit in order to play football). For these individuals it may therefore be expected that persistence in training activities motivated through introjected regulation would not compromise motivation for exercise in general, as long as the activities continue to be perceived to be useful in attaining an ultimately intrinsic goal. The finding suggests that it is too simplistic to consider motivational regulations for related activities in isolation, and that greater focus should be placed on an individual's profile of activities and their associated regulations.

This idea of specific goal driven behaviours (e.g., for a single exercise bout) being part of a series of activities driven by higher order goals is not explicitly articulated in the goal content literature, but is similar to an approach taken by Sheldon et al. (2004). In research investigating the effects different goals have on the well-being of college students, Sheldon and colleagues recorded both *personal goals*, representing students' goals for the semester (e.g., to call parents once a week; get to know more people; not to gain weight), and six broader life-goals termed *possible futures* onto which *personal goals* were mapped. The *possible futures* goals were split into extrinsic (e.g., financial success, popularity and fame, and physical image), and intrinsic (e.g., meaningful relationships, personal growth, and societal contribution). A single score for each individual was computed, termed *relative extrinsic content*, which weighted these higher order extrinsic and intrinsic *possible futures* by the number of *personal goals* subsumed within each.

Perhaps what Sheldon and colleagues' work and the present findings both reflect is that



goals exist at different levels of generality in a similar fashion to motivation, as outlined by the Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM; Vallerand, 1997a). Using this framework, goals may occur at a situational level (i.e., what I want to get out of today's activity), the contextual level (i.e., what I want to get out of exercise in general) and the global level (i.e., what are my goals for life in general). Within this conceptualisation, the potential negative effects of a small number of extrinsic goals at a situational level, like those manipulated in study 4, may be moderated by contributing to more intrinsic goals at a contextual or global level. Given that intrinsic goal focus was equally high in the control as experimental groups in study 4, interpreting the results through this hypothetical goal hierarchy framework would indicate that health and fitness represented a contextual (i.e., higher order) goal for PE for most students.

The findings of resilience to extrinsic goal content and introjected regulation in this adolescent sample have implications for the interpretation of research findings, in terms of the recommendations that may be made to teachers, parents and coaches in promoting adolescent exercise participation. As previously accepted within SDT literature, the present studies support a case for promoting the three psychological needs, intrinsic goals for exercise, and the provision of autonomy-support. However, an additional positive role has been identified for extrinsic goals and introjected regulation, which previous work suggests should be avoided as hindering to the promotion of self-determined motivation. The finding that introjected regulation promoted LTE without compromising QoL in study 2 was supported and expanded by the results of study 4, which reported that adolescents appeared to perceive greater value from lessons, and accordingly contribute greater effort and derive more enjoyment when they are highly structured and more rigidly controlled. The observational findings were also supported by qualitative work in study 3, suggesting that introjected regulation can be beneficial when playing a supportive role to more self-determined forms of regulation in contributing to the maintenance of LTE. Not only were extrinsic goals and motivation not found to be harmful, but there were found to positively boost behaviour and affect when present in addition to intrinsic goals and motives, and as such the present findings could be interpreted to suggest that such combined approaches should be actively promoted to teachers and parents.

While the findings suggest a useful direction for future research, they cannot be extended beyond the age group with which they were found. However, the characteristics of the usual social environment of this age group may provide an indication of why the findings contrasted with theory. SDT states that autonomy support cannot be ascertained by objective means, as it is a person's subjective experience of the environment which determines their outcomes (Deci & Ryan, 1985). More autonomy is not necessarily better, and more control is not necessarily worse, if either are at odds with the degree of

autonomy a person wants or expects from a given setting (Deci & Vansteenkiste, 2004). Children and adolescents are accustomed to being instructed in what they should do, and appear to a large degree to be comfortable with the degree of autonomy they are afforded (Stoll et al., 2003). This has been demonstrated over the period of school transition for example, as the students who adjust more quickly to the new school are those for whom the degree of autonomy support matches that afforded by the school they moved from and are therefore comfortable with. Students experiencing either lesser or greater autonomy support in the new school than they are used to take longer to adjust (Stoll et al., 2003). As such, the provision of structure, explicit instruction, and the maintenance of control may be just as important to adolescents as the provision of autonomy-support. Providing adequate control to match expectations may avoid creating anxiety, allowing adolescents to feel able to participate fully and to perceive the lesson to be worthwhile. In this case, a better means of providing the appropriate level of autonomy-support may be through providing choice in the content of lesson (i.e., the type of activity), provision of a convincing rationale, and acknowledgement of why such structure is needed, rather than the provision of too much freedom within the lesson.

Reflecting back to the theory behind the approach of these studies, Deci et al. (1994) recognise that internalization can occur through introjection as is seen to be taking place in the present studies. SDT suggests that while the outcomes of the process are not as positive as they are for integrated internalization, a person is at least internalising the control of their own behaviour, which is still advantageous to acting entirely through the external direction of others. Perhaps in children and adolescents who have a less developed and coherent sense of self which is implicitly necessary for the identified internalization of behaviour to be consistent with a person's core values, introjected regulation appears to be as adaptive to the adoption of behaviour as identified regulation, as it may not "feel" controlling in the same way that it would for adults. Thus, just as collective and individualistic cultures can perceive autonomy support in environments providing vastly different objective levels of choice and freedom depending on their culture and expectations (Deci et al, 2001), perhaps the culture within which children and adolescents live allows them to perceive themselves to be autonomous, and thus to derive positive behavioural and affective outcomes from operating from introjected regulations. Further exploration and formal testing of this hypothesis may be a useful direction for future research in order to develop optimally effective teaching plans. A greater volume of research would be needed in replicating these findings first however, to provide confidence that this approach would not bring about the long-term harmful effects indicated by SDT.

### **8.1.3 Quality of Life**

A central premise to the present research was that involvement in exercise would change during adolescence as a result of changes in priorities and goals (Williams et al., 2002). It was predicted that the developmental changes of adolescence would result in the increase in importance of some life domains, such as peer relationships and autonomy, and a decrease in importance of others, such as school and family (see Chapter 5 for a full discussion of these suppositions). In relation to engagement in LTE, it was predicted that exercise would decline if it conflicted with adolescents' other key goals (such as self-presentation, and physical attractiveness), or if it was motivated purely through intrinsic motivation (i.e., for fun) without being perceived to contribute to the achievement of other goals. These hypotheses were extrapolated from previous research, for example the work reporting compensatory responses among girls involved in stereotypically masculine sports, such as wearing unusually large amounts of make-up and jewellery, in comparison to those training for sports considered to be more feminine (Crissey, 2006).

Change in the relative importance of life domains was examined in study 2 (Chapter 5) through assessing *response shift* in multidimensional QoL. Contrary to expectations, no shift in priorities was found to take place, indicating that normative developmental processes and increasing life experience did not affect the relative importance of the different domains of an adolescents' QoL. However, as this null finding of change in the conceptualisation of QoL was reported alongside a finding of no change in LTE, the results neither support nor refute the hypothesis that LTE would change in response to changes in the factors important to QoL. Further research would be necessary to explore the effect of the importance of domains over a period when QoL *does* change. Better results may be achieved through studying a wider age group, by following adolescents over a longer period of time, or through studying a purposive sample of only those adolescents who do report reprioritisation of their QoL. Due to the lack of previous research in the area of response shift in adolescents or children there is no previous work with which to compare these findings.

### **8.1.4 Gender effects**

Despite the establishment of gender invariance in the hypothesised pathways of effects tested within the present thesis, considerable gender differences were found in the social exercise environments, both objectively and subjectively perceived, in which exercise takes place. In study 3, it was clear that while exercise was a mainstream activity for boys, and often appeared obligatory as a means of spending time with friends, it was rarely part of girls' social lives. This was despite girls reporting that they enjoyed exercising with their friends. Thus, to some extent exercise fulfilled a different purpose for each gender, and as such it would be expected to be relevant to different goals in either

case. In study 4, there were differences between the sexes in students' motivational responses to the same environments, suggesting there may also sometimes be subjective differences in the perceptions of exercise environments between girls and boys. In this case, girls appeared to derive greater benefits from PE environments that promoted relatedness and competence than boys, indicating perhaps a greater sensitivity to these elements of lesson delivery, or a more fragile sense of need satisfaction from exercise settings. Girls were also less likely to act out of external regulations than boys, indicating a greater ability to internalise instructions, perhaps reflective of their greater ability to find the lessons satisfying their basic needs. Together these findings highlight the importance of taking account of gender differences in the design of interventions to promote physical activity. Ignoring these differences fails to take account of potentially useful information that may allow interventions to be tailored more effectively.

SDT predicts that the pathway of effects between need satisfaction, motivation and outcomes are universal and invariant throughout human kind (Deci & Ryan, 1985, 1991). Previous work (e.g., Ntoumanis et al., 2001; Standage et al., 2005a), and indeed the cross sectional results of study 2 in this thesis have tested the assumption of gender invariance through establishing the invariance of variance and covariance structures between the two groups. Such statistical confirmations have been taken to indicate that girls and boys need not be treated differently; invariance in structural pathways suggested that both will respond similarly to improvements in mean scores for a construct at any point along the pathway. This infers that differences in mean scores at the outset (e.g., girls reporting poorer competence for exercise than boys) purely indicate that those with lower mean scores may benefit more from a given intervention. However, the differences in objective and subjective environments of girls and boys reported in the present thesis suggest that the differences between the sexes may be qualitative in addition to quantitative, i.e., different in nature in addition to different in extent. Study 4 demonstrated that girls perceived need support within the same lessons very differently to boys, which was not purely explained by different baseline levels of motivation (as this was also included as a covariate in the model). As a result they were able to internalize external instructions to a degree which boys were not. This indicates that delivery of the same lesson will not always produce equivalent results for both sexes. The results from study 3 added to this by suggesting that whatever the outcome of a single lesson, girls and boys are then returning to very different social environments in which it would be expected that the effect on LTE would be very different even had the same outcome for PE been achieved (e.g., similar strength of intention to take part in a similar activity in future).

Based on these findings, and attention to qualitative differences in exercise between gender, two very different approaches to tackling the decline in physical activity are

suggested. Discussions in the present thesis have suggested that for boys, a useful approach to promoting exercise that would be predicted to persist beyond the school years and into adulthood may be one that develops involvement in more formal exercise activities that will still be available once the pervasive social pressure for informal exercise (e.g., playing football after school) falls away. This could include gym or sports club membership. In addition, it may prove useful to work on strengthening goals for exercise that extend beyond the social domain before they leave school, to increase the likelihood of persistence in LTE in the absence of a convenient group of friends. For girls, for whom this culture of exercising as part of a social life does not occur naturally and who are reported to be less active within the high-school years, a useful approach may be the very opposite of this. For girls it may be useful to construct a social exercise environment through purposefully engaging girls in activities along with their friends in an attempt to influence social norms. In addition, the present findings suggest that girls may benefit from designing social environments that specifically promote need satisfaction, in particular enhancing competence and diverting attention from negative WR-PSPs. Potential means of achieving this are discussed further in section 8.3.

## **8.2 The benefits of taking a theoretical approach**

The discussion has so far focussed on the role of self-perceptions and goal content in influencing exercise behaviour and QoL. However, in each case a mediating effect has been demonstrated for need satisfaction and motivation. In line with a contemporary psychological approach to health behaviours (e.g., Baranowski et al., 2003), a case was argued in the introduction to this thesis of the need for research to be based on theory in order to permit the detailed analysis of mechanisms of effect. The incorporation of need satisfaction and motivation into each of the studies of the present thesis has provided just that opportunity. In the observational study (chapters 4 and 6) it was found that need satisfaction predicted the uptake or drop-out from volitional LTE, while the negative effect of WR-PSPs on LTE and QoL was fully or partially mediated by their impact on self-determined motivation. In study 4, regardless of the degree to which the intervention was successful in achieving its aims on the ultimate study outcomes (e.g., effort and intentions), much useful feedback was obtained from assessing the degree to which the manipulation was successful in influencing the mediators of change. For example, a greater effect was brought about by the experimental manipulations on autonomy, than on competence or relatedness. However, it was reported in study 2 that competence and relatedness in exercise settings are perhaps more important in predicting outcomes for LTE than autonomy. As such, this indicates that if the intervention were to be repeated and improved, a profitable approach may be through paying greater attention to facilitating

the needs for competence and relatedness, even if this may to some degree reduce support for autonomy.

As an applied theory, previous work in SDT provides good examples of how the three needs can be promoted in exercise settings. These are discussed in more detail as they arise in the discussions of previous chapters, but include approaches such as providing informational feedback against objective targets to promote competence (Vansteenkiste et al., 2005a), and presenting tasks that are co-operative rather than competitive to enhance both competence and relatedness (Ntoumanis, 2001; Standage et al., 2005a). However, in addition to supporting the call for these generic approaches, through linking WR-PSPs to need satisfaction the present thesis suggests that for individuals reporting body dissatisfaction or SPA, need satisfaction may be further enhanced through providing exercise environments which distract from these negative cognitions (see section 8.3).

The development of research is sometimes hindered by a lack of transparency in reporting not just what a study aims to do (e.g., promote perceptions of competence) but also exactly how this was attempted or achieved. Leading researchers have called for methodologies to be better explicated to provide this detailed methodological information to allow greater insight into how effects are brought about (Baranowski et al., 2003; Michie & Abraham, 2004). A particularly good example of the provision of clear information as to exactly how needs can be supported in line with SDT is provided in a paper by Wilson et al. (2006), which describes an exercise intervention delivered through an after-school club. The instructions that were given to teachers delivering the intervention were published, detailing exactly what they were asked to do and why, in order to support each of the three psychological needs. For example, for the support of relatedness, teachers were asked to “provide time for group discussion and for appropriate social interaction; include all kids in all activities; reduce cliques; don’t allow teasing or taunting; facilitate development of ownership in the program.” Although the efficacy of individual elements in bringing about the expected effects have not yet been tested, the publication of such detailed procedural information provides a good example of how researchers can demonstrate the ways in which the tenets of SDT have been operationalised in their research. This provides a greater opportunity for research peers to identify and utilise different approaches. It is likely that while many of the elements that Wilson and colleagues describe may be associated with need satisfaction, only a sub-sample will be either necessary or sufficient to bring about a positive effect. Research could better estimate which are the active ingredients by evaluating the outcomes of lessons run with each element present or absent, monitoring the effect on relatedness by the change. This has been found to be the case in other research identifying the specific behaviours necessary to provide autonomy-support (e.g., Reeve & Hyungshim, 2006). However,

teasing out which of these teacher behaviours are of primary importance in practice could then help to identify which if any of the specific instructions could contribute to a general evidence based “tool-kit.”

### **8.3 Future Research Directions**

Three main avenues for future research have emerged from the findings of the present thesis viewed as a whole. The first of these is the concept introduced in section 8.1.2 relating to the potential for a person’s goals to exist at different levels of generality. It was suggested that the effect of immediate, or situational goals for a given activity are moderated to some degree by their goals at a contextual or global level. This hypothesis was proposed as one way to explain the resilience of the adolescents to the presence of extrinsic goals in situations in which they co-occur with intrinsic goals. Using exercise as an example, future work would be useful to test the relative strength of situational (or lower-order) and contextual (or higher-order) goals in predicting outcomes of a particular exercise session. If the results are in keeping with the proposed hypothesis of a hierarchy of goals, it would be expected that higher-order goals for exercise in general (e.g., social acceptance) would be more strongly predictive of outcomes of a particular exercise session than lower-order goals (e.g., for fitness). For example, the model would predict that an adolescent who attains sufficient exercise to meet his goal for fitness may still derive little motivational or affective benefit from the success of the session if at the same time he did not meet his social goal. Furthermore, the hypothesis would suggest that individuals undertaking different types of exercise with different situational goals in mind (e.g., a training session for fitness, or a competitive sports fixture) should report similar motivational and affective outcomes if they are both driven by the same higher-order goal (e.g., to play sport to the best of my ability) regardless of what would be expected from situational level effects.

Such work would have implications for educational and coaching settings. If it is the case that situational extrinsic goals have positive outcomes if they contribute to intrinsic contextual goals (e.g., exercise for weight loss to reduce risk of injury in sport, or as part of attaining a healthy lifestyle) then it may be legitimate to promote extrinsic goals for certain activities. This would be useful if it increases the range of goal content rationales that can legitimately be promoted to would-be exercisers, which may increase the range of individuals to whom regular exercise can be perceived to be of relevance. Armed with well chosen extrinsic goals to promote, teachers may thus have a better chance of capturing the imagination and enthusiasm of the many adolescents for whom future health is not a current priority.

A second area of future work lies in building links between SDT and research in other disciplines in an attempt to enhance the efficacy of exercise and physical activity interventions. Within the present thesis, it was found that motivation, LTE and QoL were all enhanced through the satisfaction of the three basic needs. Research grounded in SDT provides many indications of how these needs can be promoted through generic means, however the present findings suggest there is additional potential for promoting need satisfaction through specifically targeting WR-PSPs. Previous work unrelated to SDT provides examples of how the negative impact of WR-PSPs on exercise engagement could be reduced. Five interventions described in the systematic review of interventions in Chapter 2 reported targeting psychosocial correlates of exercise in girls through changing the exercise environment. They attempted to reduce negative self-attributions, or to minimise their effects through approaches such as working with a homogenous sample (i.e., for example girls only, and either sedentary students or those at risk of obesity rather than including slimmer or more sporty students), changing the requirements of PE uniform to looser clothing, and changing the format of PE, for example by removing the requirement of a one mile run test (Dishman et al., 2004; Jamner et al., 2004; Neumark-Sztainer et al., 2003b; Ransdell et al., 2001). Only one study evaluated the success of the intervention on physical self-perceptions themselves (Ransdell et al., 2001). In this study improvements in self-perceptions (i.e., perceived sport competence and physical condition) over a 12 week programme were related to an increase in the number of bouts of exercise undertaken per week (Ransdell et al., 2001). The programme included components such as modeling, peer coaching, mental imagery and positive self-talk.

Future work would be useful in investigating the impact of approaches successful in reducing WR-PSPs on need satisfaction in addition to their impact on exercise. This could be used to determine whether such environmental manipulations could add to approaches to behaviour change grounded in SDT, providing a means to assimilate and build on previous research. Attempting to explicitly relate practical behaviours or environmental characteristics that have previously been found to enhance engagement in exercise (e.g., teaching positive self-talk, or changing PE uniform) to the theoretical constructs proposed by SDT also promotes a more critical approach to theory-based research. It is highly possible that not all environmental manipulations found to be effective in promoting exercise engagement will directly relate to need satisfaction or self-determined motivation. Being aware and accepting of this may prove useful in identifying the short falls of a given theory, indicating where a combined theoretical approach may be more successful than the application of any one psychological theory alone. Using a combined theoretical approach is not new, and SDT itself has often been combined with others such the theory of planned behaviour (e.g., Chatzisarantis et al., 1997; Hagger et



al., 2002) or future time perspective (Vansteenkiste et al., 2004b). A combined approach however provides no magic bullet to enhancing the efficacy of interventions, as many theories contain allied constructs such that incorporation of more than one may result in an overlap of different approaches tackling the same underlying concept (e.g., self-efficacy from SCT and perceived behavioural control from the TPB), rather than extending the breadth of intra-personal factors encompassed by the approach. It should also be acknowledged that psychological theories can only address intra-personal factors, or their interaction with the environment, yet it may be that in some instances factors external to a person may be far more important in determining health behaviours than any internal processes that psychologists may be able to influence (e.g., health status, poverty, the built environment, culture).

A final area for future research suggested by the present series of studies is that indicated by the significant gender differences in motivation and the social environment. In particular, within the student sample of study 3 it was found that while enjoyment and levels of activity were relatively high for both boys and girls, there were stark differences in the way in which each gender accrued their weekly exercise. Consistent with previous work (Mulvihill, 2000; Neumark-Stainer et al., 2006) this difference was largely attributed to the lesser support provided by the girls' social environment, with the main advantage for boys stemming from the fact that exercise formed a large part of their social lives. While this is protective of exercise levels during the school years, when boys leave this social environment to start work this easy access to exercise may well disappear. Future work would be useful to explore (a) whether drop-out from LTE does occur in school-leavers, and (b) whether sedentary social activities are substituted for previous physically active social lives, or much like the girls interviewed in study 3, whether they will expend effort in finding alternative means of obtaining regular exercise. In investigating this final research question a useful starting point may be a goal content approach. A particular direction suggested by the findings of study 3 would be to further explore the role of a person's secondary goals for the activity (for example goals such as health and fitness, or weight control) in sustaining behaviour once it no longer contributes to a person's primary goals (e.g., spending time with friends). The findings of such work would be useful to indicate whether more can be done to prevent the drop in exercise levels observed from late adolescence to young adulthood that may be due to environmental change, rather than the potentially more challenging intra-personal issues such as the lack of interest or motivation.

## 8.4 Limitations

There are several limitations to the present thesis. Firstly, no objective measure of exercise was used. While self-report measures in general (Armstrong & Welsman, 2002; Sallis & Saelens, 2000) and the LTEQ in particular (Kowalski et al., 1997; Sallis et al., 1993) have been shown to provide acceptable concurrent validity with objective instruments, they still provide a far less accurate estimate of true activity levels. The use of pedometers or accelerometers, even in a subgroup of students if practical equipment restraints precluded their use with the full sample, would have provided additional confidence in the results. In particular, the use of objective exercise measures would increase the degree to which the reported exercise levels could be interpreted as meaningful, relating directly to true physical activity levels rather than the amount of exercise undertaken relative to peers (Shephard, 2003).

A further limitation rests in the restricted age group studied, as only students in school Year 9 were asked to take part. This restriction was imposed partly to attain a sample of students at the same stage in their academic lives in order to restrict the variance introduced by changing academic pressures (in Year 10 students begin work towards GCSEs, thus shifting their focus to passing exams). In addition it was included in order to maximise the detection of effects in both boys and girls, given the expected age-related gender differences in outcome measures. Puberty occurs at different times for boys and girls, and is an ongoing process estimated to be reached for most girls by 13, and most boys by 15. Thus at the age of thirteen (Year 8), it was considered unlikely that many boys would have reached puberty. As the basis for part of the main hypothesis of the thesis rested on changes in behaviour resulting from changes in priorities that are triggered by maturation, these younger students were not included. Additionally, of the studies detailing the age-related decline in physical activity, the earliest age at which this effect has been reported is at 14 (Year 9; Riddoch et al., 1991).

However, given the limited change observed in LTE or QoL observed within the sample over the period of one year, this restriction appeared to limit the ability of studies to detect the expected effects. The inclusion of a wider age group would have provided more comprehensive information relating to whether there was change in LTE or QoL over time, but that this occurred either earlier or later than in the present sample, or to identify a change too gradual to be detected within a single year group. The possibility that this lack of change was a real effect should also not be discounted. Previous extensive work tracking physical activity throughout the lifespan using large cohorts provides convincing reliable and replicable evidence that overall activity declines (Thompson et al, 2003a; Biddle et al., 2004a; DoH, 2004a). If the current finding of no change in LTE was found

for a wider age group, greater support would be provided for alternative explanations of the results reported here. For example, the lack of change in LTE could indicate a lack of sensitivity to change in the measure used (i.e., self-report LTEQ) which would have implications for future work, or that in the decline of overall physical activity, LTE, as opposed to incidental physical activity, enforced exercise or sedentary behaviour, plays only a small part. The present set of studies were primarily designed to test a model of predicted associations and did not aim to provide a comprehensive account of change throughout adolescence. As such, it is still fit for purpose despite these limitations, however, the restricted age range limits the degree to which the findings can be generalised.

## 8.5 Conclusions

The need for theory to be applicable to more than one behaviour or setting is a growing concern for health psychologists (Abrahams, 2006). As discussed in the review of physical activity interventions in Chapter 2, the lack of application of theory to interventions limits to what extent they can inform research by restricting their ability to identify the specific elements of an approach that are responsible for bringing about an effect (Baranowski et al., 1998). Knowing how and why an intervention works is crucial if it is to benefit a wider number of people than the study sample alone. By approaching the research question through the application of self-determination theory (SDT) the present thesis has thus been able to link with, and build on previous work. It is hoped that through measuring and reporting standardised constructs, and explicating the independent effects of each it will also be informative to future research in developing the ideas further.

Overall the present thesis paints a fairly positive picture. Both adolescent boys and girls reported still enjoying exercise at the age of 14 or 15, and many were able to overcome the barriers they perceive to exercising, such as not being good at sports or not having friends to exercise with, to find ways of keeping regularly active. However, having negative WR-PSPs (such as perceiving oneself to be overweight, body dissatisfaction and SPA) predicted poorer need satisfaction in an exercise context, lesser self-determined motivation, and consequently lower levels of leisure-time exercise.

The adolescents participating in this research seemed generally resilient to the predicted negative effects of controlling forms of motivation (introjected regulation) and extrinsic goals on their behaviour and well-being. Indeed, these extrinsic factors seemed to have a cumulative effect of boosting motivation and engagement in activity without having a deleterious effect on QoL. Even in low exercisers, with low intrinsic motivation (i.e., *avoiders* in Chapter 6), introjected regulation was associated with the uptake of behaviour over time rather than its inhibition. Indeed, based on the present findings, there appears

to be a small benefit in emphasising extrinsic goals for exercise as a means of focusing individuals who may be concerned about their weight on a healthy way of coping, which may appear more relevant or important to them than generic “health” reasons for exercise. Adolescents appeared comfortable with environments which adults may objectively classify as controlling, as they are used to being, and expect to be provided with reasons and justifications for their daily activities by adults in authority. It was confirmed that over the longer term these extrinsic reasons are not as powerful as intrinsic reasons for the perpetuation of behaviour and QoL, but they may provide a “kick-start” to engaging adolescents in the types of exercise that they can continue into adulthood. However, as these findings diverge from theory (Ryan & Deci, 2000), and previous research (e.g., Sheldon et al., 2004; Vansteenkiste et al., 2004b), further work is called for to refute or replicate the present findings in similarly ecologically valid settings, and to test for the potential negative long term effects of attempting to initiate behaviour through extrinsic motives and goals.

As no evidence of an age-related decline in exercise levels emerged within the present sample, and no change in the relative priority of the different domains of life, the present work was not able to conclude on the initial research question that changes in participation in exercise arise from the failure of exercise to contribute positively and meaningfully to pertinent life goals during adolescence. However, it was found that extrinsic goals were attributed high value by participants, and to a small degree promoted identified regulation, suggesting that extrinsic reasons for exercise can readily and autonomously become adopted at this age. Despite the short term advantages reported in the present study, from an SDT perspective the adoption of extrinsic goals for exercise would be predicted to result in poorer long term participation (Deci & Ryan, 2000), and as such the original research question still appears a valid direction for future research.

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### Methods of Measuring Physical Activity

#### ***Objective Measures of Exercise and Physical Activity***

The most accurate objective measure of physical activity is doubly labelled water, which is a means of monitoring metabolic rate through tracking oxygen consumption following the ingestion of non-radioactive isotopes of water (Pate, 1993; Kohl et al., 2000). It provides a highly accurate measure of total energy expenditure, providing a gold standard against which other techniques of estimating physical activity can be validated, however its cost, and lack of ability to provide information beyond total energy expenditure limit its use as a practical research tool (Kohl et al., 2000). More practical objective measures of physical activity include heart rate monitors (Dishman et al., 2001), pedometers (Tudor-Locke et al., 2004), accelerometers (Janz et al., 1995), and equipment such as Actiheart units which synchronise accelerometer data with heart rate data (Brage et al., 2003). Most of these can be easily attached to, or under, clothing without causing significant discomfort or interference to participants (Sarkin et al., 2000).

Heart rate monitors attached directly onto the skin provide a trace of an individual's "work rate" during the time it is worn. If traces can be obtained at sufficiently frequent intervals to capture the sporadic nature of physical activity of children and adolescents, they can provide useful indications of the frequency and duration of bouts of exercise at different intensities, and thus provide a good picture of overall physical activity. Heart monitors work on the assumption that individuals who spend longer with elevated heart rates are more physically active, however this is subject to some level of inaccuracy as other stressful stimuli (e.g., anxiety, level of fitness, emotional stress) may also bring about a similar effect on heart rate (Kohl et al., 2000). The comparison of heart rate information between studies can also be problematic, as different researchers have suggested different means of establishing heart-rate thresholds for describing moderate and vigorous activity levels (Armstrong & Welsman, 2006). Due to the variation in heart rate due to factors other than exercise, the expense of units, and practical difficulties involved in attaching electrodes, heart rate monitoring is more commonly used for measuring acute effects of exercise stress in a controlled environment rather than monitoring total daily activity levels (Kohl et al., 2000).

Pedometers are the cheapest means of objectively measuring activity. However as they are less precise than other objective measures, a greater number of days of activity are needed to provide reliable results (e.g., six days are recommended for children; Tudor-Locke et al., 2006). A systematic review of the construct validity of pedometers showed weak inverse relationships between age and body mass index (BMI), but a strong correlation (median  $r = .96$ ) with physical fitness (Tudor-Locke et al., 2004). Epidemiological studies using pedometers concur with findings obtained using other measures to report greater activity in boys than girls, and a decline in activity rates over age (e.g., Cardon & De Bourdeaudhuij, 2004). Accelerometers incorporate a slightly more sophisticated form of motion sensor, which can provide information regarding motion along three axes, providing more detailed information on the intensity and duration of activities in addition to the estimate of total physical activity provided by pedometers. As such, accelerometers can be particularly useful in evaluating interventions that require information on the pattern of exercise and the time spent engaged in activities of different intensity (Sallis & Saelens, 2000). Pedometers and accelerometers have been reported to be of similar accuracy in recording habitual daily activities in the mid range of intensity, however poorer sensitivity has been reported for pedometer at slow walking speeds, and more erroneous movement recorded by accelerometers when participants were travelling by car (Le Masurier & Tudor-Locke, 2003).

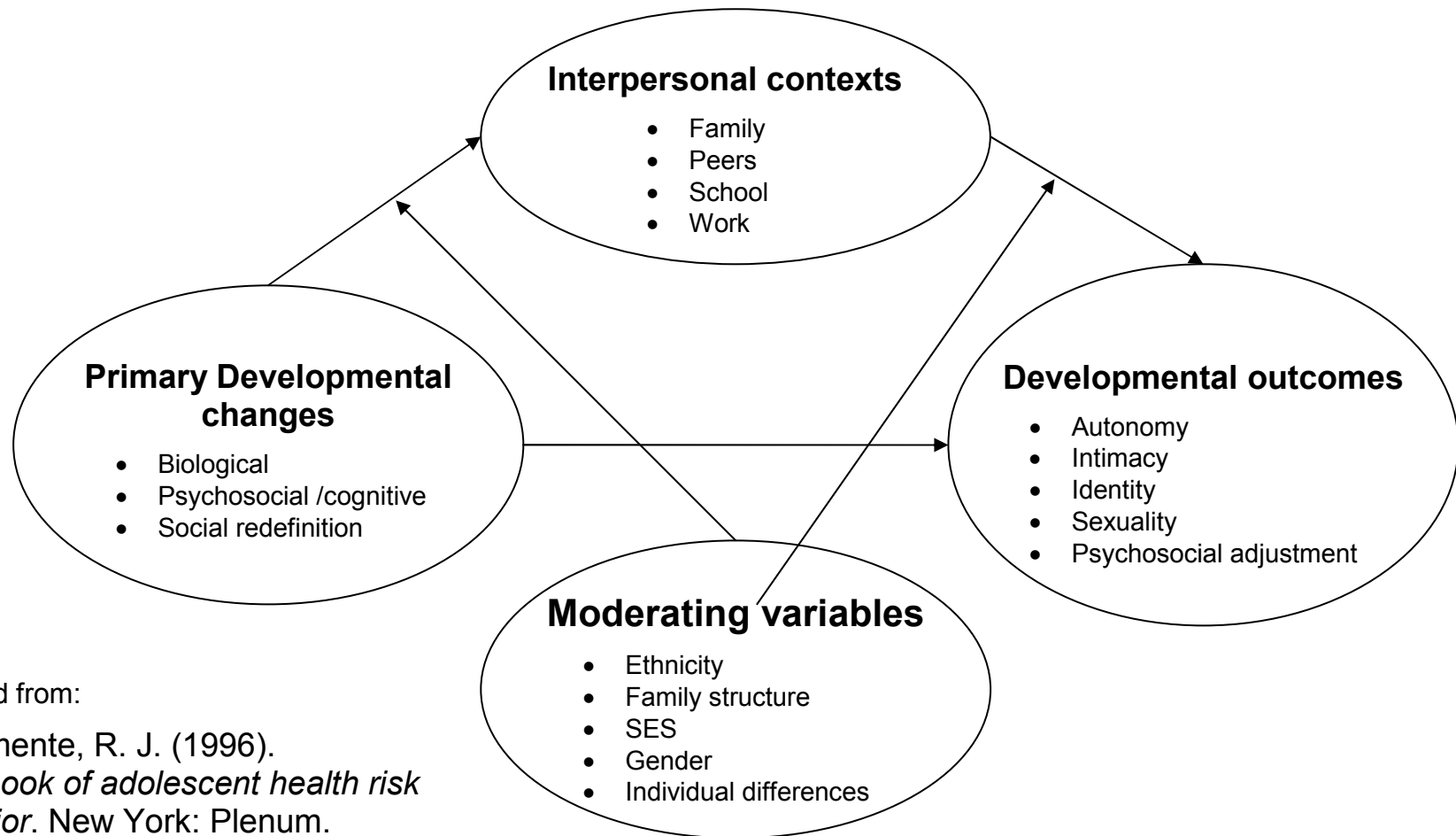


A disadvantage of all objective measures is their cost, and the reliance on the co-operation of participants to obtain full and accurate data. Use of pedometers with children for example has been fraught with difficulties in terms of ensuring the equipment is worn everyday, in the correct manner, and is not tampered with (Tudor-Locke & Myers, 2001). It was of note that numerous pedometer studies reported explicitly asking participants not to tamper with the equipment indicating that this is a recognised concern (e.g., Ng et al., 2006; Tudor-Locke et al., 2006), however, no study could be found which reported on tamper rate from which the extent of the problem can be assessed. Additionally, wearing any form of objective measure can result in *reactivity*, i.e., an increase in activity levels due to the awareness of being monitored. Reactivity can be minimised by using sealed apparatus so that participants cannot obtain ongoing feedback for their activities (Vincent & Pangrazi, 2002), and through the collection of multiple days of measurement (Tudor-Locke & Myers, 2001).

### ***Direct Observation***

Direct observation, such as using the standardised SOFIT procedure (Rowe et al., 1997) or Children's Activity Rating Scale (CARS; Durant et al., 1993) can also be used to assess levels of physical activity, and has been used to good effect with younger children for whom self-report measures may be less reliable (Sirard & Pate, 2001). These measurement protocols require the detailed rating of activity (e.g., sitting, standing, walking, running) according to standardised criteria, to make observations comparable across raters and studies (Rowe et al., 1997). However, direct observation is time consuming and therefore costly, and is not appropriate for large samples (Durant et al., 1993; Pate, 1993). While it may be possible to use these measures in research assessing short discrete time periods (e.g., PE lessons), they are less useful in assessing the pattern of daily or after school activity. In addition, participants are often critically aware that they are being watched, which may induce reactivity effects over the short term (Kohl et al., 2000).

## DiClemente's Framework of Adolescent Development



Adapted from:

DiClemente, R. J. (1996).  
*Handbook of adolescent health risk behavior*. New York: Plenum.

**Excluded Measures from a Systematic Review of Quality of Life Instruments for Adolescents**

Instrument No. domains (no. items)	Age	Reliability & Validity	Development	Reason for rejection
<b>CHIP-AE (Child Health and Illness Profile)</b>  6 (153)  Authors: Starfield et al., 1993	11-17	Test retest (1 week interval) $r = .53$ to $.87$ Internal consistency – Cronbach’s $\alpha = .40$ to $.90$  Convergent validity– correlated with other QoL measures, $r = .59$ - $.68$	A taxonomy of health profile-types for describing adolescent health. Items were drafted from previous instruments, then refined through focus groups asking what “health” means to young people.	Health-related measure with restricted breadth of domains; items phrased to detect functional status.  46 of the items are specific to children/adolescents with health problems
<b>CHQ-CF87 (Child Health Questionnaire)</b>  12 (87)  Authors: Landgraf, et al., 1997, 1998	11-18	Internal consistency - Cronbach’s $\alpha = .52$ to $.66$  Discriminant validity – correlations of domains with other measures.	Child equivalent of SF-36, available in parent and child response formats, initially developed with 14 domains.	Health focussed items with restricted breadth of domains, revealing ceiling effects with healthy populations (Raat, Landgraf, Bonsel, Gemke, & Essink-Bot, 2002; Waters, Salmon, Wake, Wright, & Hesketh, 2001)

Instrument No. domains (no. items)	Age	Reliability & Validity	Development	Reason for rejection
<p><b>CQOL (Child Quality of Life Questionnaire)</b></p> <p>15 (15)</p> <p>Authors: Graham et al., 1997</p>	9-15	<p>Test-retest (2 months apart) - <math>r = -.22</math> to <math>.90</math> Internal consistency: Cronbach's <math>\alpha</math> <math>= .85</math> to <math>.87</math></p> <p>Validation not conducted for the child completed forms (parent proxy available).</p>	<p>Developed from interviews with parents and children with physical or psychiatric disorders, or learning disabilities.</p> <p>Subsequent validation/use: Limited sample size in initial validation testing (N=76)</p>	Health-related measure with restricted breadth of domains; focussed on limitations of function rather than positive aspects of QoL.
<p><b>ComQOL (Comprehensive Quality of Life measure)</b></p> <p>7 (35)</p> <p>Authors: Cummins, 1997</p>	12-18	<p>Internal consistency: Satisfaction items - <math>\alpha = .75</math> to <math>.83</math> Importance ratings - <math>\alpha = .75</math> to <math>.77</math> Test-retest - <math>r = .40</math> to <math>.88</math></p> <p>Convergent validity- correlated against fear and anxiety scales: <math>r = .32</math> and <math>.40</math></p>	Adapted from the adult version of the scale without recourse to an adolescent sample. Researchers' and professionals views reflected only.	<p>Did not meet criterion for adolescent involvement in development.</p> <p>Majority of items measure objective factors, only 7 items relating to subjective evaluations of QoL.</p>
<p><b>COOP charts (Dartmouth COOP Functional Health Assessment Charts)</b></p> <p>6 (6)</p> <p>Authors: Wasson et al., 1994</p>	12-21	<p>Test-retest reliability <math>r = .77</math></p> <p>Construct validity (correlation between COOP and longer QoL measures)- <math>r = .62</math></p>	Picture and word combined chart, developed from a literature review and focus groups with health care workers and adolescents.	<p>Designed for use in a clinical setting, focused on functional status.</p> <p>QoL is measured by a single item - global QoL score.</p>

Instrument No. domains (no. items)	Age	Reliability & Validity	Development	Reason for rejection
<b>HAY (How are you?)</b>  5(80)  Authors: Bruil et al., 1999	7-13	Internal consistency – Cronbach's $\alpha = .77$ to $.86$ .  Construct validity– correlated with other QoL scales, $r = .53$ to $.59$		Insufficient overlap with adolescent age range.  Limited to HRQOL.
<b>Juvenile wellness and health survey</b>  5 (76)  Authors: Steiner et al., 1998	10-18	Internal consistency – Cronbach's $\alpha = .56$ to $.81$ .  No validity measures reported.	Focussed on specific behaviours of interest to researcher, such as how often an adolescent drinks or takes drugs etc., rather than concerns generated by the adolescents themselves.	Did not meet criterion for adolescent involvement in development. Not a general QoL measure, but an assessment of healthy/unhealthy behaviour.
<b>KINDL</b> (revised version)  4 (24)  Authors: Bullinger et al., 1994	8-18	Internal consistency- all scales $\alpha > .75$ , test retest – $r = .80$  Discriminant validity – differentiated between healthy and disease groups Convergent validity – Correlated with SF-36 ( $r = .53 - .75$ ) and CHQ ( $r = .72$ )	Derived from interviews with children based on a conceptual model, comprising a generic core scale to which disease specific modules can be added. Designed for use with chronically ill children.	Health-related measure with restricted breadth of domains; items phrased to detect functional status.
<b>Nordic Quality of Life Questionnaire</b>  4(74)  Authors: Lindstrom & Koehler, 1991	12-18	Not yet reported.	No details found.	Lack of validation and reliability data on a UK sample.

Instrument No. domains (no. items)	Age	Reliability & Validity	Development	Reason for rejection
<b>PedsQL 4 (Pediatric Quality of Life Questionnaire)</b>  4 (23)  Authors: Varni et al., 1999	5-18	Internal consistency – Cronbach's $\alpha = .79$ to $.89$ Total scale correlation, $r = .93$ Poor item-total correlations for some scales (9/23 below 0.4).  Discriminant validity –differentiated between children on treatment vs. in remission	Initially developed for cancer patients, then expanded through focus groups and cognitive interviews with healthy children.	Health-related measure with restricted breadth of domains; ceiling effects reported for healthy populations (Eiser, Vance, Horne, Glaser, & Galvin., 2002; Varni, Seid, & Kurtin, 2001).
<b>QLQC (Quality of Life Questionnaire for Children)</b>  13 (118)  Authors: Bouman et al., 1999	8-12	Internal consistency: Cronbach's $\alpha = .62$ to $.88$ . Test – retest (2 week interval): $r = .42$ to $.85$ ( $p < .001$ for all).  Discriminant validity – differentiated children with gastro-intestinal anomalies, or emotional problems from general population	Developed from clinical experience, and combining existing measures.  Piloted on a group of 139 children with gastro-intestinal anomalies, and 136 children within the general population.	Did not meet criterion for adolescent involvement in development.  Insufficient overlap with broad adolescent age range.
<b>TACQOL (TNO AZL Child Quality Of Life)</b>  8 (56)  Vogels et al., 1998	6-15	Internal consistency – Cronbach's $\alpha = .89$ to $.95$	Developed as an adult measure from literature reviews, and then translated for children. Resulted in poorer theoretical distinction between domains as not all items were translated.	Did not meet criterion for adolescent involvement in development.  Measure of functional status and the emotional responses to this rather than the broader concept of QoL.

\* Reliability and validity statistics are reported only for child self-report versions when adult proxies are available.

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## Rasch Modelling

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Rasch modelling is the statistical technique designed to transform raw data that is not discrete in nature (i.e., response categories, yes/no options) into equal-interval scales, where the intervals have greater meaning than those arbitrarily applied in the questionnaire design, and which apply beyond the single sample being tested. The model takes account of how well different items discriminate between participants, and of the pattern of responses that an individual makes (i.e., can account for anomalous results, such as made through guessing). From the pattern of the sample's responses to questionnaire items, Rasch modeling attempts to better quantify the difference in meaning of the change represented by a unit of difference in scores. Thus, the difference between a score of 1 for *never*, and 2 for *seldom*, is not assumed to represent the same difference to respondents that the unit difference between a score of 3 for *quite often* and 4 for *very often* may represent. It is argued that psychometrics that relies on the use of additive scales is flawed, as it makes unjustified assumptions that such measures are accurately measuring the attribute of interest (e.g., Bond & Fox, 2001). In order to compete with the accepted reliability of measurements in the physical sciences, instead greater attention needs to be given to checking, and controlling for these assumptions.

Rasch scoring is based in a simple logistic model which expands conventional additive Likert scales at the upper and lower limits. It enables measures to differentiate between statements of different strength within the same subscale (e.g., from the KIDSCREEN general mood scale; "*Have you felt fed up*" versus "*Have you felt that everything in your life goes wrong?*") for which a score of "strongly agree" on each might mean very different things for a child's mental health. Through Rasch modeling arbitrary unit increases on any one item are no longer treated as ordinal scales, but transformed to interval scales based in the empirical evidence (i.e., how they differentiate between participants, and the range of responses for each item). In addition, two questions belonging to the same attitude object (or domain) can be effectively weighted according to how extreme are the responses they extract. In a study directly comparing the performance of Rasch modelling with the traditional approach of additive scores for likert scales, Fitzpatrick et al (2004) calculated the relative precision of each item (dividing the Rasch score by the likert score) creating a 95% confidence interval from 1000 bootstrap samples. They reported that scoring through Rasch modelling did significantly increase sensitivity through decreasing standard error.

### Questionnaires used in Study 2

#### 4.1.1 *Perceived weight status*

How you think of yourself in terms of your weight. Please tick the box that you think best describes you:

Underweight	Slightly underweight	About the right weight	Slightly overweight	Overweight
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### 4.1.2 *Perceived pressure to lose weight*

Using the following scale, please circle the response that best captures your own experience:

	Never	Rarely	Some- times	Often	Always
1. I've felt pressure from my friends to lose weight.	1	2	3	4	5
2. I've noticed a strong message from my friends to have a thin body.	1	2	3	4	5
3. I've felt pressure from my family to lose weight	1	2	3	4	5
4. I've noticed a strong message from my family to have a thin body.	1	2	3	4	5
5. I've felt pressure from the media (eg TV and magazines) to lose weight.	1	2	3	4	5
6. I've noticed a strong message from the media (eg TV and magazines) to have a thin body.	1	2	3	4	5

#### 4.1.3 *Body satisfaction*

We would like to know how you think about your body. Please circle one of the following to indicate how satisfied you are with the following:

	Extremely dissatisfied	Dissatisfied	Neither satisfied or dissatisfied	Satisfied	Extremely satisfied
Your weight	1	2	3	4	5
Your body shape	1	2	3	4	5



Your muscle tone	1	2	3	4	5
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#### 4.1.4 Social Physique Anxiety Scale (SPA)

**Thinking about how you look, please tell us how much the following statements are true for you:**

		Not at all	Slightly	Moderately	Very	Extremely
1	I wish I wasn't so uptight (worried) about my physique/figure	1	2	3	4	5
2	There are times when I am bothered by thoughts that other people are evaluating my weight or muscular development negatively	1	2	3	4	5
3	Unattractive features of my physique/figure make me nervous in certain social settings	1	2	3	4	5
4	In the presence of others I feel apprehensive about my physique/figure	1	2	3	4	5
5	I am comfortable with how fit my body appears to others	1	2	3	4	5
6	It would make me uncomfortable to know other were evaluating my physique/figure	1	2	3	4	5
7	When it come to displaying my physique/figure to others, I am a shy person	1	2	3	4	5
8	I usually feel relaxed when it is obvious that others are looking at my physique/figure	1	2	3	4	5
9	When in a bathing costume/trunks, I often feel nervous about the shape of my body	1	2	3	4	5

#### 4.1.5 Reasons for Exercise Inventory (REI)

Thinking of the reasons that you, personally, exercise, and what you hope to get out of it, please circle how true the following statements are for you: **I exercise.....**

	Not at all important		Moderately important			Extremely important	
	1	2	3	4	5	6	7
1) To be slim	1	2	3	4	5	6	7
2) To increase my energy levels	1	2	3	4	5	6	7
3) To improve my strength	1	2	3	4	5	6	7
4) To maintain my physical well-being	1	2	3	4	5	6	7
5) To improve my appearance	1	2	3	4	5	6	7
6) To be attractive to members of the opposite sex	1	2	3	4	5	6	7
7) To improve fitness	1	2	3	4	5	6	7
8) To meet new people	1	2	3	4	5	6	7
9) To socialise with friends	1	2	3	4	5	6	7
10) To have fun	1	2	3	4	5	6	7
11) To redistribute my weight (that is, get bigger in some areas, and smaller in others)	1	2	3	4	5	6	7
12) To improve my overall body shape	1	2	3	4	5	6	7
13) To alter a specific area of my body	1	2	3	4	5	6	7
14) To improve my endurance or stamina	1	2	3	4	5	6	7
15) To improve my flexibility and co-ordination	1	2	3	4	5	6	7
16) To maintain my current weight	1	2	3	4	5	6	7
17) To improve my muscle tone	1	2	3	4	5	6	7
18) To cope with sadness, depression	1	2	3	4	5	6	7
19) To improve my mood	1	2	3	4	5	6	7
20) To lose weight	1	2	3	4	5	6	7
21) To cope with stress, anxiety	1	2	3	4	5	6	7
22) To improve my overall health	1	2	3	4	5	6	7
23) To increase my resistance to illness and disease	1	2	3	4	5	6	7

#### 4.1.6 Behavioural regulations for exercise questionnaire

##### Why do you take part in exercise?

We are interested in the reasons why people decide whether or not to take exercise. We probably all know why we *should* do exercise, but these may not be the reasons why we do *actually* take exercise ourselves. It's the real reasons that *YOU PERSONALLY* do exercise that we are after, so please tell us how far each of the statements are true *for you*, by circling the number that fits best.

		Not true for me	1	2	3	Very true for me
1	I exercise because other people say I should	0	1	2	3	4
2	I feel guilty when I don't exercise	0	1	2	3	4
3	I value the benefits of exercise	0	1	2	3	4
4	I exercise because it's fun	0	1	2	3	4
5	I don't see why I should have to exercise	0	1	2	3	4
6	I take part in exercise because my friends/family say I should	0	1	2	3	4
7	I feel ashamed when I miss an exercise session	0	1	2	3	4
8	It's important to me to exercise regularly	0	1	2	3	4
9	I can't see why I should bother exercising	0	1	2	3	4
10	I enjoy my exercise sessions	0	1	2	3	4
11	I exercise because others will not be pleased with me if I don't	0	1	2	3	4
12	I don't see the point in exercising	0	1	2	3	4
13	I feel like a failure when I haven't exercised in a while	0	1	2	3	4
14	I think it is important to make the effort to exercise regularly	0	1	2	3	4
15	I find exercise a pleasurable activity	0	1	2	3	4
16	I feel under pressure from my friends/family to exercise	0	1	2	3	4
17	I get restless if I don't exercise regularly	0	1	2	3	4
18	I get pleasure and satisfaction from participating in exercise	0	1	2	3	4
19	I think exercising is a waste of time	0	1	2	3	4

#### 4.1.7 Need satisfaction

##### a) Relatedness:

With other people I do sports and exercise with I feel:

	Strongly disagree	disagree	Slightly disagree	neutral	Slightly agree	agree	Strongly agree
Supported	1	2	3	4	5	6	7
Understood	1	2	3	4	5	6	7
Listened to	1	2	3	4	5	6	7
Valued	1	2	3	4	5	6	7
Safe	1	2	3	4	5	6	7

##### b) Competence:

How good are you generally at sport and exercise?

	Strongly disagree	disagree	Slightly disagree	neutral	Slightly agree	agree	Strongly agree
I think I am pretty good at sport and exercise	1	2	3	4	5	6	7
I am satisfied with my performance in sports and exercise	1	2	3	4	5	6	7
When I have participated in sport or exercise for a while, I feel pretty competent	1	2	3	4	5	6	7
I am pretty skilled at sport and exercise	1	2	3	4	5	6	7
I can't do sport or exercise very well	1	2	3	4	5	6	7

##### c) Autonomy:

When I am in an exercise or sports session....

	Strongly disagree	disagree	Slightly disagree	neutral	Slightly agree	agree	Strongly agree
I can decide which activities I want to practice	1	2	3	4	5	6	7
I have a say regarding what skills I want to practice	1	2	3	4	5	6	7
I feel that I do sport and exercise because I want to	1	2	3	4	5	6	7
I have some choice in what I do	1	2	3	4	5	6	7
I feel a certain freedom of action	1	2	3	4	5	6	7

**4.1.8 Leisure time exercise questionnaire (LTEQ);**

During a typical **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your free time (write on each line the appropriate number). This does not include PE lessons, but does include any sports you play in lunch time or after school which you can choose whether or not you want to do.

	<b>Times per week</b>
<b>a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY)</b> (e.g., running, jogging, hockey, football, squash, basketball, judo, netball, roller skating, vigorous swimming, vigorous long distance bicycling)	_____
<b>b) MODERATE EXERCISE (NOT EXHAUSTING)</b> (e.g., fast walking, cricket, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)	_____
<b>c) MILD EXERCISE (MINIMAL EFFORT)</b> (e.g., yoga, archery, fishing from river bank, bowling, golf, easy walking)	_____

During a typical **7-Day period** (a week), in your leisure time, how often do you engage in any regular activity **long enough to work up a sweat** (heart beats rapidly)?

OFTEN	SOMETIMES	NEVER/RARELY
1. <input type="checkbox"/>	2. <input type="checkbox"/>	3. <input type="checkbox"/>

## 1. Physical Activities and Health

In general, how would you say

1.

- excellent
- very good
- good
- fair
- poor

Thinking about the last week ...

	not at all	slightly	moderately	very	extremely
2. Have you felt fit and well?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Have you been physically active (e.g. running, climbing, biking)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Have you been able to run well?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the last week ...

	never	seldom	quite often	very often	always
5. Have you felt full of energy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the questions in this

	not at all important	Slightly important	Moderately important	Very important	Extremely important
1. How important to you is having good physical health?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. How important to you is being physically active?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 2. Feelings

	not at all	slightly	moderately	very	extremely
1. Has your life been enjoyable?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Have you felt pleased that you are alive?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Have you felt satisfied with your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the last week ...		never	seldom	quite often	very often	always
4.	Have you been in a good mood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.	Have you felt cheerful?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6.	Have you had fun?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the questions in this section		not at all	Slightly	Moderately	Very	Extremely
	How important to you is being in a good mood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### 3. General Mood

Thinking about the last week ...		never	seldom	quite often	very often	always
1.	Have you felt that you do everything badly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.	Have you felt sad?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.	Have you felt so bad that you didn't want to do anything?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.	Have you felt that everything in your life goes wrong?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.	Have you felt fed up?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6.	Have you felt lonely?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7.	Have you felt under pressure?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the questions in this section		not at all	Slightly	Moderately	Very	Extremely
	How important to you is being free from feeling bad about things?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 4. About Yourself

Thinking about the last week ...		never	seldom	quite often	very often	always
1.	Have you been happy with the way you are?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
2.	Have you been happy with your clothes?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
3.	Have you been worried about the way you look?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
4.	Have you felt jealous of the way other girls and boys look?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
5.	Would you like to change something about your body?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>

Thinking about the questions in this section		not at all important	Slightly important	Moderately important	Very important	Extremely important
How important to you is feeling good about yourself?		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 5. Free Time

Thinking about the last week ...		never	seldom	quite often	very often	always
1.	Have you had enough time for yourself?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
2.	Have you been able to do the things that you want to do in your free time?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
3.	Have you had enough opportunity to be outside?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
4.	Have you had enough time to meet friends?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
5.	Have you been able to choose what to do in your free time?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>

Thinking about the questions in this section ...		not at all important	Slightly important	Moderately important	Very important	Extremely important
How important to you is having enough free time to do the things you want to?		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



## 6. Family and Home Life

Thinking about the last week ...

	not at all	slightly	moderately	very	extremely
1. Have your parent(s) understood you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Have you felt loved by your parent(s)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the last week ...

	never	seldom	quite often	very often	always
3. Have you been happy at home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Have your parent(s) had enough time for you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Have your parent(s) treated you fairly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Have you been able talk to your parent(s) when you wanted to?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the questions in this section

	not at all	Slightly	Moderately	Very	Extremely
How important to you is your family and home life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 7. Money Matters

Thinking about the last week ...

	never	seldom	quite often	very often	always
1. Have you had enough money to do the same things as your friends?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Have you had enough money for your expenses?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Do you have enough money to do things with your friends?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the questions in this

not at all   Slightly   Moderately   Very   Extremely

How important to you is having enough money?

## 8. Friends

Thinking about the last week ...

never   seldom   quite often   very often   always

1. Have you spent time with your friends?

never   seldom   quite often   very often   always  
           

2. Have you done things with other girls and boys?

never   seldom   quite often   very often   always  
           

3. Have you had fun with your friends?

never   seldom   quite often   very often   always  
           

4. Have you and your friends helped each other?

never   seldom   quite often   very often   always  
           

5. Have you been able to talk about everything with your friends?

never   seldom   quite often   very often   always  
           

6. Have you been able to rely on your friends?

never   seldom   quite often   very often   always  
           

Thinking about the questions in this

not at all   Slightly   Moderately   Very   Extremely

How important to you are your friends?

## 9. School and Learning

Thinking about the last week ...

not at all   slightly   moderately   very   extremely

1. Have you been happy at school?

not at all   slightly   moderately   very   extremely  
           

2. Have you got on well at school?

not at all   slightly   moderately   very   extremely  
           

3. Have you been satisfied with your teachers?

not at all   slightly   moderately   very   extremely

Thinking about the last week ...

	never	seldom	quite often	very often	always
4. Have you been able to pay attention?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Have you enjoyed going to school?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Have you got along well with your teachers?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the questions in this section

	not at all	Slightly	Moderately	Very	Extremely
How important to you is your school life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 10. Bullying

Thinking about the last week ...

	never	seldom	quite often	very often	always
1. Have you been afraid of other girls and boys?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Have other girls and boys made fun of you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Have other girls and boys bullied you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the questions in this section

	not at all	Slightly	Moderately	Very	Extremely
How important to you is being free from bullying or teasing?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Items included in the *thentest* (Study 2)

“We know a lot can change in a year, and are interested to find out whether you feel certain parts of your life are going better or worse than this time last year, or that you have different expectations of how things should be going.

Therefore we’ve got a few questions to ask about this, to see what if anything has changed. “

#### In general last year:

1a. Did you feel fit and well?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>
1b. How important was it to you to be in good physical health?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>

2a. Did you feel satisfied with your life?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>
2b. How important to you was being in a good mood?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>

3a. Did you get on well at school?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>
3b. How important to you was your school life?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>

4a. Did you feel so bad that you didn't want to do anything?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
4b. How important to you was being free from feeling bad about things?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>

5a. Did you and your friends help each other?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
5b. How important to you were your friends?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>

6a.	Were you able to talk to your parent(s) when you wanted to?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
6b.	How important to you was your family and home life?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>

7a.	Were you worried about the way you looked?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
7b.	How important to you was feeling good about yourself?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>

8a.	Were you able to choose what to do in your free time?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
8b.	How important to you was having enough free time to do the things you want to?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>

9a.	Did you have enough money to do the same things as your friends?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
9b.	How important to you was having enough money?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>

10a.	Did other girls and boys bully you?	never <input type="radio"/>	seldom <input type="radio"/>	quite often <input type="radio"/>	very often <input type="radio"/>	always <input type="radio"/>
10b.	How important to you was being free from bullying or teasing?	not at all <input type="radio"/>	slightly <input type="radio"/>	moderately <input type="radio"/>	very <input type="radio"/>	extremely <input type="radio"/>

**Have there been any major events in your life since this time last year that you think may have had an effect on how you feel?** (e.g. losing or gaining a family member, moving house, changing friends)

Please mention any here: .....

.....

.....

## Appendix 5.2

### Difference in overall QoL, and response shift in domains between those experiencing positive, negative or no significant life events

	<b>No significant life event</b>	<b>Positive life event</b>	<b>Negative life event</b>	<b>Kruskal- Wallace test</b>
	Mean (sd)	Mean (sd)	Mean (sd)	
QoL time 1	3.64 (.55)	3.64 (.53)	3.53 (.51)	1.79 (NS)
QoL time 2	3.58 (.56)	3.68 (.47)	3.41 (.47)	5.10 (NS)
Change in QoL	-1.25 (9.35)	.74 (10.46)	-2.29 (7.76)	.59 (NS)
<b>Response shift (difference between pre-test and <i>thentest</i>)</b>				
Physical health	.04 (1.13)	-.10 (1.09)	-.03 (1.17)	.40 (NS)
Psychological well-being	.08 (1.09)	-.40 (1.43)	-.26 (.83)	4.70 (NS)
School	-.08 (1.01)	.048 (.59)	-.37 (.71)	4.19 (NS)
Mood and emotions	.25 (1.16)	.52 (1.08)	.63 (1.17)	4.67 (NS)
Peers	.23 (1.11)	-.40 (1.35)	.13 (.91)	4.04 (NS)
Family relationships	.05 (1.15)	-.18 (1.18)	-.11 (1.01)	.76 (NS)
Self-perceptions	.00 (1.25)	.09 (1.06)	-.05 (1.33)	.14 (NS)
Autonomy	-.08 (1.11)	-.45 (1.26)	-.55 (1.13)	9.05 (p<.05)
Finance	-.10 (1.12)	-.32 (1.29)	-.16 (1.04)	1.04 (NS)
Bullying	.09 (1.12)	.32 (.57)	.16 (1.08)	2.36 (NS)

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### Semi-structured interview schedule

#### Gain Consent

1. *“I’ve asked you to take part in this interview today as a way for us to find out more about why people your age take part in exercise both in and out of school – what encourages you, and what puts you off. It will be entirely anonymous, so I won’t be putting your name on any paperwork, or recording it on tape, which I hope means you feel you can say anything you like.*

Before we start I want to tell you exactly what will happen, and check you are still happy to take part. Like any research which is not part of your school work, you don’t have to take part if you’d prefer not to, and once we’ve started you can stop at any time, or skip any question you don’t want to answer. If you do want to stop at any point, you can just say so, you don’t need to give me a reason. Whether or not you do take part will not affect your schooling in any way – your teachers will not even know.

This is what will happen: First I will show you the questionnaire you filled out last week, and see whether or not you would agree with your answers if you were to answer it again today. Then, with your permission I’ll put the tape recorder on, and start the interview. The reason I tape the interview is because I wouldn’t otherwise be able to remember what we talked about – my writing is too slow. The only person who will listen to this tape is me, and it won’t be stored with your name on it. Is that OK?

I have about 10 questions I would like to ask you, and I would like you to tell me anything that comes into your head on the subject. Don’t worry that you haven’t had a chance to think about it for long, just say what comes to mind – you can always add things later. If at any time you don’t quite understand what I mean, just tell me and I’ll put it another way.

Finally, if there are any questions you’d like to ask, or if there are things I haven’t asked you about this topic but you think are important, then please feel free to raise them at any time. I’d like this to be more like two people talking to each other than a formal interview. Does that all sound clear to you?

OK, so having heard all that, are you happy to take part?

IF YES:



*Sign consent form*

## Questionnaire items

2. “Looking back at the answers you gave on the questionnaire, do you agree that your answers would be more or less the same today?”

IF NO:



“Which questions would you answer differently today?”

“Why do you think your answers might be different?”

## Main Interview

During this interview I'm going to be asking you about the exercise you do, in and out of school. So before I start it's probably a good idea to discuss what I actually mean by that, so we're both talking about the same thing. What I'm actually interested in talking about is what I call “purposeful” exercise. That is, physical activity that you do because it is exercise, not physical activity that you do by accident. So, it includes any sports, it includes things you do with friends, such as skateboarding, or cycling around, and it includes things like walking to or around places that you go to out of choice, when you don't have to. It can be organised sports, run by adults, or a casual kick around in the park. All that it doesn't include are things like getting into a sweat when doing housework, or walking somewhere because you have to, not because you choose to. So in school, doing PE would count as “purposeful” exercise, but after school, you need to think about why you're active to decide whether it counts as “purposeful” or not.

Thinking about the physical activity you've done in the last week according to this definition, is there anything you're not sure about?

1. *“Ok, can you tell me what types of exercise you normally do. Let's say over the last week, can you talk me through what you did each day? We'll start with what you do in school first, then what you do outside school.”*
2. *“Is there anything else that you do quite often that you haven't done in this last week?”*
3. *“In your own words, I'd like you to tell me what you think are the reason or reasons you normally take exercise, and what makes you put in effort, or decide not to bother too much. Firstly thinking about the exercise you do in school. If there are different reasons for different sorts of exercise, say why you put effort in during PE compared with outside PE, then please tell me about each one separately.”*

*“And secondly, what reasons do you have for the exercise you take outside school?”*



4. *“If there are some times or places that you are more keen to do exercise than others, what is it that makes the difference?”*
5. *“Thinking back a few years to when you started at this school, or back in your last year at primary school if you can remember, can you tell me whether you did more or less exercise than you do now?”*

*Firstly in school.....And secondly out of school.....”*

IF CHANGED:



*“Why do you think this has changed?”*

6. *“Do you think you enjoyed it more, less, or the same as you do now?”*

IF CHANGED:



*“Why do you think this has changed?”*

7. *“What do your friends think of people who do a lot of exercise?”*

*“Do they do much themselves?”*

*“Does what they think affect how much exercise you take part in?”*

*“What about in school generally, is it a good thing to be seen to be good at sports, and trying hard in PE?”*

*“Do you ever take part in sports or exercise activities to fit in with others, or to impress others?”*

8. *“Do you feel that you are reasonably good at the types of exercise you do?”*

*Firstly in school.....and secondly out of school.”*

9. *“Now, I know you don’t have a choice about taking part in PE, but overall do you feel you get to decide for yourself whether or not you are a physically active person?”*

10. *“What about exercise outside school. Do you take part in any organised exercise (like sports clubs), or do you do things with friends or family?”*

IF YES:



*“Who got you into that – was it your idea or someone else?”*

*“Would you feel guilty because of them if you stopped doing it?”*

*“Is it ever the case that you feel you’d be letting people down, like friends or parents if you didn’t do the sport and exercise you currently do?”*

11. *“When we look at the answers from the questionnaire all put together, they give the picture of someone who does exercise, not because they always particularly enjoy it, but because they would feel bad if they didn’t. So they might do it to avoid feeling guilty, or because they want other people to think highly of them. Does this sound like you?”*

IF YES:



*“If you do feel a bit bad about yourself when you don’t do exercise, in what way do you feel bad in particular?”*

### **Profile of participants interviewed as part of a study investigating the basis for introjected regulations in adolescence**

*Participant 1:* High level female gymnast.

The primary reason for exercise given by this participant was enjoyment. She trains for 30 hours a week, takes part in PE at school when present, but often misses school to take part in gymnastics competitions. Occasionally she wishes she could have a day off (as she trains every day) but would feel guilty if she did so, knowing she'd be desperate to get back into it the following day if she did so. The reason for this guilt was out of concern that if she skipped a training session, she might not perform as well as she feels she could do in future competition. She expressed the opinion that her motivation has changed since she was younger, as she now has a greater appreciation of what she has to lose, and is now motivated in part by future aspirations which was not the case when she was younger. Her main source of motivation is maintaining her high level of performance, and the reason for high scores on the introjected scale due to concern that missed training sessions would compromise her performance.

*Participant 2:* Highly active male club rugby player.

The primary reason for exercise given by this participant was enjoyment. He enjoys the rugby he plays, but recognises the need to do other sports and activities in order to maintain the fitness required to do well. He feels autonomous in being an active and fit individual. His high scores for introjected regulation result from feeling guilty for missing exercise, as he would lose the fitness he needs to perform well, both for his own sake and for that of his team. He feels guilty if not exercising sufficiently to keep fit in order to perform well within this unit, and would feel guilty if he left the sport as a whole as he feels the team need him.

*Participant 3:* Highly active, confident female.

The primary reason for exercise given by this participant was enjoyment, and a good way to have fun with friends. This participant feels much admired by her peers for her sporting ability, and appears motivated to continue in part by this social recognition. She notes a change (increase) in her confidence in taking part in sport from when she was younger, which has increased her desire to take part. Unusually, she doesn't mention the health or fitness benefits of exercise at any point during the interview, and takes part only in social contexts. If she feels guilty for missing an exercise session, this is due to the knowledge that she would have enjoyed it had she taken part. She would feel guilty if she stopped playing for a team as this would let them down, however she expresses this more as pride that she is needed, rather than guilt acting as a deterrent.

*Participant 4:* Moderately active male, acutely sensitive to judgements from others.

This participant reported that he had two equally strong reasons for exercise; enjoyment and keeping in shape. He perceives himself to be overweight, and a few months prior to the interview decided to take action to change his appearance through exercise, to lose weight and develop more muscle. He is highly conscious of others' opinions of him in

relation to his size and athletic ability, and reported that he would increase his exercise or effort expenditure in response to negative comments from others. Although he describes his father's input as positive, he cites his father as encouraging him to keep active for the explicit purpose of avoiding weight gain. He would feel guilty if he missed sessions from his self-appointed exercise regime, as this would make him feel "fat and lazy", qualities he believes others would attribute to him if he remained overweight.

*Participant 5:* Highly active, enthusiastic male.

The primary reasons for exercise given by this participant were enjoyment, and keeping fit. This participant has a moderate level of perceived competence, but is in a football team, and does casual sports with friends. He appeared not to have given too much consideration to his reasons for exercise, other than it representing a "good use of time", but his other comments suggest he takes part in sport as a means of social integration. He feels he would be unlikely to take part in much sport if his friends didn't do so with him. Although scoring highly on the measure of introjection, in the interview it did not appear that this participant would feel particularly guilty at missing exercise sessions, and would be unlikely to make himself do sport if he didn't feel like it. Any guilt he did feel may be more due to skipping activities that represent a good use of time, than any inherent quality of the exercise itself.

*Participant 6:* Overweight female, with a low activity level.

The primary reasons for exercise given by this participant were for health and losing weight. This participant did not take part in any regular organised activity, and had inactive friends who neither exercise with her, nor encourage her to take more exercise. She suffers some discomfort (leg pain) on exercising if she hasn't taken part in much exercise in a while, which leads to some feelings of guilt if she skips sessions. She seemed generally aware that she should do more exercise to try and keep her weight down both to help this discomfort and for her general health. Despite this knowledge, and high scores for introjected regulation, she was unusual within the sample for not translating this knowledge into action, as she took little extracurricular exercise at the time of interview, and had no definite plans to do so in the near future. She does enjoy exercise in social settings, more for the sense of camaraderie and being part of a team than for a quality of the exercise itself, and finds social recognition or praise very rewarding. However her main motivation for the exercise she does do is for weight loss, both for health and appearance's sake, and her high scores on introjected regulation stem from the knowledge that she *should* exercise for her health.

*Participant 7:* Moderately active male.

The primary reasons for exercise given by this participant were for fitness, and for fun. This participant felt he was generally active all the time and took pride in this; he cycled to school, took part in sport during break times, and spent time with friends by playing sport after school. He acknowledges that he does so much exercise because this is what he and his friends do together, i.e., much of his enjoyment stems from the social element of exercise, and he would not enjoy it for its own sake if his friends were not involved. However he does value being active, and notices that he feels better following exercise. The reason for his high scores on introjection stem from concern that missing sessions would indicate a slip back to being as inactive as he was when younger, as if he is concerned that if he became inactive again, he would find it difficult to regain his momentum. He made no mention of why he felt this was a less preferable status.

*Participant 8:* Highly active, enthusiastic female exerciser.

The primary reason for exercise given by this participant was for health and fitness, and secondly for enjoyment. While not considering herself a particularly accomplished sports person, this participant joins all the school clubs she can to take exercise, and carries out toning exercises at home suggested by magazines. She has a strong sense of the importance of doing sport and exercise for her health, although she states she is happy to adhere to this as she enjoys it. She implies that she considers exercise personally important, a mandate she has consciously adopted. She would feel guilty skipping exercise as this would make her feel she was lazy.

*Participant 9:* Highly active female, mostly outside school.

The primary reason for exercise given by this participant was enjoyment. She states secondary reasons of keeping fit and healthy, although this comes across as something she has been told, rather than something she really believes, and does not emerge again during the interview. She prefers exercising with friends, many of whom are active themselves and mutually supportive in this, although the activities they do are mostly through organised sports clubs at school. It emerges she is an accomplished dancer, attending classes 5 times a week, and having taken part in professional performances. She enjoys PE for the challenge and sense of achievement it provides. Therefore overall her motivation for exercise stems from the opportunity of a challenge and development of skill, albeit preferred in a safe 'known' environment. She did not give the impression of truly feeling guilty on missing exercise, and her high introjected responses are likely to stem from missing opportunities to improve her skills for the rewards (exams, or becoming a PE teacher) to which she aspires.

*Participant 10:* Highly active, confident male.

The primary reason for exercise given by this participant was for fun, with a secondary aim of keeping fit. This participant exercises regularly with his father, in addition to playing club football and informal exercise with friends. He exercises for the stimulation of doing a lot of different activities, in addition to enjoying specific sports. He provides little evidence of introjection to back up his questionnaire responses, but any guilt he may feel would be out of concern for loss of fitness, or letting his team mates down.

*Participant 11:* Highly active, male county rugby player

The primary reason for exercise given by this participant was keeping fit and in shape, although he clearly enjoys exercise too. This participant reports having made friends through sport, as an unexpected but welcome side effect, but this has subsequently become a major reason why he now participates so frequently. In spite of his evident ability (playing for his county rugby team), his primary reason for playing sport does not appear to be related to achieving excellence or recognition, or for the fun of the game. He had intended to give up rugby up due to the discomfort/injury it results in, which prevent him from taking part in other forms of exercise, but was talked into staying with his team by friends. Instead his primary motivation goal appears to be ensuring he gets a high volume of exercise (he talks with pride of how his others have remarked on this) in order to maintain an athletic physique. Sport seems to be a vehicle to achieving sufficient exercise for this aim. The main source of motivation for this participant is for appearance, and factors underpinning his high scores on introjected regulation due to the need to maintain a sufficiently frequent regime to attain this. The social and mood benefits he identifies appear as an acknowledged benefit of exercise, but not a driving force for taking part.

*Participant 12:* Regular male exerciser

The primary reason for exercise given by this participant was enjoyment, although he also acknowledges that in order to stay fit enough for his preferred sport, he has to engage in additional training sessions. This participant's father is an exercise trainer, so he receives parental support for exercising, and has a daily exercise schedule that he has set himself. He recognises his personal responsibility for exercising for fitness, values this and considers it important. The reasons underpinning his high score for introjected regulation appear to relate to guilt at failing to adhere to his own exercise schedule, as this would result in a drop of fitness.

*Participant 13:* Moderately active, self-conscious female

The primary reason for exercise given by this participant was keeping fit. This participant reports feeling embarrassed to exercise in front of others, and gets most of her exercise through a swimming club after school, where she feels more confident. She gets support and encouragement from parents, though not from friends to exercise, and exercise is not something she and her friends discuss, or do together. She views exercise as something that you *should* do for your future health, reporting the view that doing exercise is "co-operating", but personally endorses this, considering it her decision whether or not to adhere to this. Thus although exercise is something she does enjoy, she gives the impression that at school at least it is the appreciation that it is something she *should* do for health and fitness that motivates her to take part, given the environmental barriers to true enjoyment that she perceives. It seems her high scores for introjected regulation stems more from the generic guilt that she would experience when going against any sound advice, rather than specifically to guilt from missing out on exercise itself.

*Participant 14:* Active female, low in competence, but high in enthusiasm

The primary reason for exercise given by this participant was to be healthy. This participant appears to have made an active decision to become a healthy person, which incorporates both regular exercise and healthy eating. She feels less competent at sport than her friends, and often feels embarrassed by her lack of ability in PE when working with more able students. Although her friends are sporty, they don't exercise together, again perhaps due to variation in ability. She runs regularly alone after school for fitness. Overall this participant's motivation towards exercise is for health, and high scores reported on the introjected regulation scale relate to feelings of guilt that skipping would halt her progress to improving her performance, and because it would go against what a healthy person 'should' do. Having said this, she appears to have embraced this and enjoys pursuing exercise for the aim of fitness.

*Participant 15:* Moderately active male

The primary reasons for exercise given by this participant were for fun and fitness, although he seems to have a relatively low drive towards exercise overall, it being something he does to pass the time rather than through passion for sport. He does not take part in any formal exercise clubs, but goes to the gym with his brother and plays football with his friends. His main reasons for taking part are fitness, but also to a degree fitting in with others. Although not explicitly articulated, my impression is that his high score on introjected regulation stems from feeling bad that through laziness/apathy he has missed out on something that he would have enjoyed. He also states that he would feel guilty for skipping exercise for the sake of missing out on getting fit.

*Participant 16:* Reluctantly active male

The primary reason for exercise given by this participant was to keep fit and avoid weight gain. This participant appears to have lost some of the enthusiasm for exercise he had when younger, but continues with sport as this is what his friends are doing, and with home gym equipment due to concerns about appearance and fitness. He would feel guilty if he stopped doing exercise as he would become unfit, and he appreciates he needs to do it to be healthy. In addition, he views exercise as a means to avoid weight gain, which would be viewed on negatively by his friends.

*Participant 17:* Highly self-conscious, active female

The primary reason for exercise initially stated by this participant was enjoyment, although later in her interview she admits to strong feelings of concern about her weight, and states that this is the major reason for her to want to do as much exercise as she does. It is clear that she perceives significant barriers to enjoying exercise in public (i.e., school) environments. However, the types of exercise she undertakes (daily horse-riding and dance classes) suggest she has found enjoyable ways of exercising away from the scrutiny of boys, and as such at present it appears her primary motivation for exercise remains enjoyment. Although the fear of weight gain could act as a deterrent to giving up these activities, her inherent enjoyment of them makes it unlikely that she would do so at present, so although a genuine concern, and a reason for her high score in the introjected regulation scale, its contribution to motivation seems secondary.

*Participant 18:* Frequent exercising male, social exerciser

The primary reason for exercise given by this participant was enjoyment, and health and fitness. This participant got into the sports he does through his friends following interest kindled by the rugby World Cup, and he now prefers to exercise in a social group. He also has gym equipment at home which he also uses regularly with the aim of developing big muscles, however this appears to be a secondary aim confined to this activity alone. His main motivation for exercise remains enjoyment, enhanced through the time it involves spending with friends, although he also values the health and fitness effects. His high score for introjection stems from an appreciation that lack of exercise would lead to him getting out of breath, but he seems generally unclear why he would feel bad, and little evidence could be inferred from his other answers

### Intervention Pilot Study

A pilot study for the proposed research was conducted in a single co-educational state school in the South West of England. The school was similar in size and catchment area to those included in the final sample. Participants were recruited by class, and were informed at the start of the study that taking part in the research was optional, and that their schooling would not be affected in any way if they chose not to take part. Although PE was usually run in single sex groups in this school, the pilot study was run in groups of mixed sex in order to provide similar lesson climates for both boys and girls. The lessons were run by the principal researcher, assisted by a second researcher, and observed by a further senior researcher. Two classes were run on a single morning, both autonomy supportive, but one with intrinsic and one with extrinsic goal content (i.e., conditions 1 and 3, see Chapter 8, Table 8.1). After these two sessions, the research team conferred to review the quantitative results (i.e., manipulation checks), observations/experiences of practical issues in running the study, and comments obtained from observing school teaching staff. Alterations were made to the protocol, questionnaire items, and lesson scripts as necessary, and two further classes then run (conditions 2 and 4) according to a revised format one week later.

#### **Pilot Procedure**

Participants completed a baseline questionnaire before a PE lesson, recording their initial motivation towards the lesson (SIMS; Guay et al., 2000) and aims for taking part in PE (i.e., goal content). The completion of the questionnaires took between five and ten minutes. Students were allocated a numbered sticker to wear on their shoulder, to allow those who dropped out of the lesson, or ceased to engage to be identified. The principal researcher then read the initial lesson framing script to students. Each work station of the fitness circuit was demonstrated by the second researcher, alongside brief scripted instructions consistent with lesson condition. A jogging-based group warm up was led by the principal researcher, taking 3-5 minutes. The introduction of the project, completion of questionnaires, and issuing of instructions took approximately 15-20 minutes.

The lesson was then run in accord with previously described procedure (see Chapter 7, section 2.4). The circuit continued until 10 minutes before the end of the lesson, to allow for the completion of the post-intervention questionnaire. Due to time spent introducing the study, completing questionnaires and demonstrating activities, the total time spent in physical activity by the students was only approximately 15 minutes of a one hour lesson. The post-intervention questionnaire contained the manipulation checks, and a second (repeated) measure of motivation to assess change as a function of the social context and student willingness the complete the same measure twice in such close succession.

#### **Pilot study results**

##### **Observer feedback**

Following feedback from the observing senior researcher, the scripts were amended to present to better ensure that all pupils perceived the intended message through greater use of repetition. Amendments were made with reference to other scripted intervention research (e.g., Vansteenkiste et al., 2005). For example, the scripts were made more explicit by changing phrasing from “*This lesson is intended to improve your health and fitness*” to “*This lesson has been specially designed to help you to improve your health and fitness. Doing moderately hard exercise through activities like this has been shown to help people your age to keep themselves and their bodies healthy.*” One school teacher who had recently attended a training session on running gym-based fitness sessions for adolescents suggested that in line with this training, the intended goals should also be



repeated *during* the lesson. This is as students are easily distracted from the initial instructions as the lesson continues, or may fail to concentrate fully at the start of the lesson. The intended goal content was repeated in the middle of the instructions, and summarised at the end.

Teachers highlighted that too much choice of workstation in the autonomy supportive condition appeared to have a negative impact on student focus and effort. In the initial design, participants in the autonomy supportive condition were allowed to choose which stations they worked at and in what order, allowing them to construct their own circuit of activities. Students in the control condition were told to move round clockwise through each station in turn. The negative effect of the autonomy supportive condition was considered to be a result of students' perceiving competition for space on the most popular stations which were largely occupied by more dominant students. The amount choice given to students was subsequently reduced in order to increase the degree of structure provided by the lesson to reduce the confounding effects of perceived competition and uncertainty. The teacher observers also reported that running a mixed sex lesson was distracting to students. All four teachers involved reported that they would expect better work rates, and importantly for this intervention a better focus on the researcher's instructions and the task presented if the intervention was run in single sex groups as is the case with usual PE lessons.

### **Quantitative feedback**

In the initial two pilot lessons, lesson goal content was measured through a free response self-reported before the intervention script, and again after the lesson. However, the measure did not discern between pupils or conditions as it resulted in a wide range of responses including both intrinsic and extrinsic goals which showed no change following the intervention. Therefore, ahead of the second round of pilot lessons a more sensitive measure was developed drawing from items used to measure climate perceptions in previous work (Standage et al., 2005b). Three items were included to measure whether participants perceived the 'focus' of the lesson to be on health and fitness (intrinsic goals; e.g., "*The focus of this lesson was on exercising for health and fitness*"), and measuring whether participants perceived the focus to be on weight and appearance (extrinsic goals; e.g., "*The focus of this lesson was on exercising to make you look better*"). This version of the questionnaire was tested in the final two pilot lessons.

Quantitative analysis of the questionnaire data was conducted using non-parametric (Mann-Whitney) tests due to the small sample size. The manipulation for autonomy support was successful (Table 8.1). Participants perceived the autonomy supportive conditions to provide more choice and freedom than the controlling conditions ( $U=694.5$ ;  $Z=-2.98$ ,  $p<.001$ ). Statistical tests of the goal content manipulations were carried out between the final two pilot sessions only, following the rewording of the lesson framing scripts and inclusion of revised goal content focus items. Significant differences between conditions were reported for both goal types. Participants in the extrinsic goal content condition reported higher perceptions of a weight and appearance focus to the lesson than those in the intrinsic goal content condition, in line with the intended lesson framing ( $U=102.000$ ,  $z=-3.55$ ,  $p<.001$ ). However, participants in the extrinsic goal content also perceived a significantly higher health focus to the lesson ( $U=153.00$ ;  $z=-2.43$ ,  $p<.05$ ). The scripts were thus adjusted further to emphasise the health focus more clearly to the intrinsic goal condition, and to ensure the minimum possible health focus was perceived in the extrinsic goal condition. The emphasis of intrinsic as opposed to extrinsic goal focus was approached by providing examples of health benefits in the intrinsic goal condition (e.g., feel better and avoid illness), and ensuring that references to weight control were always accompanied by reference to appearance to minimise association with the potential health benefits of weight control (e.g., control your weight to look good to others).

**Table A7.1 Results from manipulation checks of pilot study**

	Autonomy supportive conditions <sup>a</sup>	Controlling conditions	Extrinsic goal content	Intrinsic goal content
<b>Perceived lesson autonomy support</b>	4.21 (1.24)	3.41 (1.23)**	-	-
<b>Perceived health focus<sup>b</sup></b>	-	-	5.56 (1.04)	4.51 (1.36)*
<b>Perceived weight focus</b>	-	-	5.60 (1.63)	3.80 (1.57)**

\* p<.05, \*\*p<.001

<sup>a</sup> intrinsic/extrinsic goal content groups were combined to test for the manipulation of autonomy supportive/controlling lesson climate.

<sup>b</sup> comparisons were between the two controlling conditions only, due to differences in measuring manipulation checks

It was noted that completion of the motivation questionnaire prior to the lesson took some considerable time ( $\geq 5$  minutes), and participants were subsequently reluctant to complete the repeated measure after the lesson, demonstrated by failure to complete the second motivation measure, or providing patterned responses. Therefore, to reduce the response burden and potentially increase the reliability of the motivation questionnaire after the lesson, the design was changed to obtain a baseline measure from assessing contextual motivation towards PE on a separate occasion.

### ***Summary of protocol changes resulting from the pilot study***

- 1) The provision of clearer and more explicit statements of the researcher's intentions for the lesson. Lesson scripts were refined to include repeated summaries of the intended goal for greater emphasis.
- 2) The intended goal content was further repeated half way through the lesson.
- 3) Greater structure was added to the autonomy supportive lessons, by 'recommending' that students move through the stations in a clockwise direction while emphasising that they were free to skip any activity that they preferred not to do.
- 4) Lessons were run in single sex groups.

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## Scripts for lesson framing in Study 4

### GROUP A: Autonomy supportive, intrinsic goals

This PE lesson has been specially designed to improve your *health and fitness*. It will take the form of a circuit of activities, which all add something different to the work out. We will be asking you to go round the stations that we have set up, and have a go at the different types of exercises suggested at each.

I know that not everyone likes this sort of exercise, so I can perfectly understand that you might not find it interesting all the time. However, doing moderately hard exercise through activities like this has been show to help people your age to *keep themselves and their bodies healthy*. Hence doing this circuits class might be important to you because it'll help you to be *physically strong and healthy*.

I'm going to demonstrate all the stations to start with, and there are instructions to remind you when you get there, or you can just ask me again if you're not sure. So all you need to do is choose a station that you'd like to start at. To get the most out of the session in terms of *improving your health and fitness*, we've worked out you'd need to spend about 30 seconds at each station. We'll let you know when that time's up by blowing the whistle. This time is just a guide though, so you're free to stop beforehand if you've had enough, and on the other hand of course you don't have to stop if you don't want to! After the whistle, we would ask you to move clockwise on to the next station so you get to try them all. We are asking everyone to follow the same circuit so it's easier to make sure there isn't a big crush of people on each station, but you don't have to take part in every station. You can choose to skip any station you would prefer not to do, and either go and join another group, or take your whole group to an empty station and carry on from there. I'll blow the whistle again then to let you know when the next 30 seconds starts. We'll have a longer break half way through, but you can choose to take a break at any time you feel you need to.

So just to sum up, we're asking you to try your very best over the class, because doing so will help you to *keep yourself fit and healthy and in good shape*. You can choose which station you want to start at, and you don't have to do any stations that you would prefer not to. Do you have any questions?

### GROUP B: Controlling, intrinsic goals

This PE lesson has been specially designed to improve your *health and fitness*. As you can see, there are 10 different activity stations which all add something different to the workout, and you have to do them all over the course of the lesson. Doing moderately hard exercise through activities like this has been show to help people your age to *keep themselves and their bodies healthy*. Hence doing this circuits class should be important to you because it'll help you to remain *physically strong and healthy*.

I'm going to show you what you have to do at all the stations to start with, and there are instructions to remind you when you get there if you forget. To start with I'll assign you to one of the work stations, and blow the whistle when you have to start. You have to work for 30 seconds on every station, which I'll be timing, and you should carry on with the activity until the whistle blows again to tell you to stop. You must then move straight on, clockwise, to the next station.

So just to sum up, you have to do your best in this lesson, because this will help to *improve your health and fitness*, so that you *keep yourself fit and healthy and in good shape*. You must work your way through all the stations, moving clockwise onto the next one when the whistle blows. You should keep going for 30 seconds at each one, until the whistle tells you to stop.

**GROUP C:**            Autonomy supportive, extrinsic goals

This PE lesson has been specially designed to help you to *stay slim, and look better to others through improving your body shape and toning your muscles*. We will be asking you to go round the stations that have been set up, each of which will add something different to the work out, and have a go at the different types of exercises suggested at each.

I know that not everyone likes this sort of exercise, so I can perfectly understand that you might not find it interesting all the time. However, doing moderately hard exercise through activities like this has been show to help people your age to *keep themselves looking slim, and appear more attractive to others*. Hence doing this circuits class might be important to you because it'll help you to remain *physically appealing to others*.

I'm going to demonstrate all the stations to start with, and there are instructions to remind you when you get there, or you can just ask me again if you're not sure. So all you need to do is choose a station that you'd like to start at. To get the most out of the session in terms of *keeping slim, and improving how you look to others*, we've worked out you'd need to spend about 30 seconds at each station. We'll let you know when that time's up by blowing the whistle. This time is just a guide though, so you're free to stop beforehand if you've had enough, and on the other hand of course you don't have to stop if you don't want to! After the whistle, we would ask you to move clockwise on to the next station so you get to try them all. We are asking everyone to follow the same circuit so it's easier to make sure there isn't a big crush of people on each station, but you don't have to take part in every station. You can choose to skip any station you would prefer not to do, and either go and join another group, or take your whole group to an empty station and carry on from there. I'll blow the whistle again then to let you know when the next 30 seconds starts. We'll have a longer break half way through, but you can choose to take a break at any time you feel you need to.

So just to sum up, we're asking you to try your very best over the class, because doing so will help you to *remain physically appealing to others, and help you to avoid gaining weight*. You can choose which station you want to start at, and you don't have to do any stations that you would prefer not to. Do you have any questions?

**GROUP D:**            Controlling, extrinsic goals

This PE lesson has been specially designed to help you to *stay slim, and help you to look better to others through improving your body shape and toning your muscles*. As you can see, there are 10 different activity stations which all add something different to the workout, and you have to do them all over the course of the lesson. Doing moderately hard exercise through activities like this has been show to help people your age to *keep themselves looking slim, and appear more attractive to others*. Hence doing this circuits class should be important to you because it'll help you to remain *physically appealing to others*.

I'm going to show you what you have to do at all the stations to start with, and there are instructions to remind you when you get there if you forget. To start with I'll assign you to one of the work stations, and blow the whistle when you have to start. You have to work for 30 seconds on every station, which I'll be timing, and you should carry on with the activity until the whistle blows again to tell you to stop. You must then move straight on, clockwise, to the next station.

So just to sum up, you have to do your best in this lesson is because doing so will help you to *remain physically appealing to others, and help you to avoid gaining weight*. You must work your way through all the stations, moving clockwise onto the next one when the whistle blows. You should keep going for 30 seconds at each one, until the whistle tells you to stop.

**CONTROL GROUP:**            neutral climate, goal free

This PE lesson will take the form of a circuit of activities. There are 10 stations with different activities for you to do, which I will demonstrate, and you'll also find a list of instructions at each one to remind you of what to do when you get there. To get the most out of the session, without tiring you out too much, we've worked out you'd need to spend about 30 seconds at each station. I'll use the whistle to signal the start and finish of each activity, and when you finish you just move clockwise onto the next one. I'll give you a little time to change activities, and then blow the whistle again to signal the start of the next activity.

So to sum up, this lesson just involves you having a go at the different activities in a circuit. We'll blow the whistle to signal the start and finish of each 30 second block, and to let you know when to move onto the next one. You just move round in a clockwise direction each time.

### Detail of activities for intervention lessons

#### Wall press-ups

*Autonomy supportive:* A good way to do wall press-ups, is to stand a little away from the wall, so that when you stretch your arms out, your hands rest comfortably on the wall. Then you just lean slowly in, so your nose nearly touches the wall, and slowly out again. You can do as many as you like, and as fast or slowly as you like, but for this exercise you are likely to get the most out of it if you do go quite slowly, so you're always in control.

*Controlling:* To do wall press-ups you have to stand back from the wall so that when you stretch your arms out, your hands rest flat on the wall. You then have to lean slowly in, so your nose nearly touches the wall, and slowly out again. You have to do this one slowly for it to do you any good.

*Neutral:* For wall press-ups all you do is stand away from the wall, so that when you stretch your arms out, your hands rest on the wall. Then you just lean slowly in, and slowly out again, the slower the better really, so you're always in control.

#### Sit-ups

*Autonomy supportive:* For sit-ups, you can just pick a mat to lie on, with your back flat on the floor, and your legs bent. Then you just slide your hands up towards your knees, lifting your shoulders off the floor, then slide them down again. Again you can do as many or as few as you like. A good tip is to keep your eyes on the ceiling, so you know you're doing it right.

*Controlling:* For sit-ups, you have to lie with your back flat on the floor, and your legs bent. You put your hands on your thighs, then you have to lift up towards your knees and down again. To do it right you have to keep your eyes on the ceiling.

*Neutral:* For sit-ups, you just lie with your back flat on the floor, and your legs bent. Sliding your hands along your thighs, you slowly lift your trunk up towards your knees and then relax down again, keeping your eyes on the ceiling.

#### One Legged throwing

*Autonomy supportive:* for this exercise you are practising standing on one leg while throwing a tennis ball against the wall. Choose which leg you want to start on, and find a distance from the wall of about a metre or so, that you feel makes it a challenge but still possible. Then you may want to then get your balance first, before starting to bounce the ball off the wall, and catching it. You can change legs whenever you want to, or keep going if you feel you're doing well.

*Controlling:* Stand on one leg, one metre (a large step) away from the wall. Then bounce the ball off the wall repeatedly. Do one 10 on one leg, then change to the other.

*Neutral:* This exercise is to stand about a metre (a large step) away from the wall on one leg, then bounce the ball against the wall, catching it each time. Try doing 10 catches back to back before changing legs.

#### Bench steps

*Autonomy supportive:* Bench steps can be done in a number of ways, whichever you prefer. So you can step on and off with one foot, or jump off with both feet, changing feet as you like.

*Controlling:* This one is stepping on and off the bench as many times as you can in the 30 seconds. You step up with one foot, bring the other to join it, then step down again with the first foot, and off with the second.

*Neutral:* For this station you just step on and off the bench as many times as you can for 30 seconds

## **Sprints**

*Autonomy supportive:* This station is for you to practise your sprinting. So just pick two lines, for example the markings on a badminton court, and sprint between them. Give yourself plenty of rest between them, maybe doing a couple in a row, and then resting while your partner does a couple before going again.

*Controlling:* For the sprinting station you have to sprint between the edges of the badminton court lines. Do this with a partner, you sprint twice, there and back, then they go while you rest, and once they're back you have to go again.

*Neutral:* For the sprinting station you just have to sprint between the edges of the badminton court. If you can do this with a partner, or threes, one of you goes twice, running there and back while the other rests, then you change over.

## **Jogging**

*Autonomy supportive:* The jogging station is a chance for you to get your breath back a bit, and recover. So it's up to you how much you do, and how far you go. So for example as a baseline you could choose to jog round and just touch all the four walls of the gym while the others carry on, doing less or more depending on how you feel.

*Controlling:* The jogging station just means you have to jog slowly round the gym, making sure you touch all four walls before you get back to where you started.

*Neutral:* The jogging station is a chance for you to get your breath back a bit, and recover. So you just set off jogging round the gym at your own pace, aiming to touch all the four walls of the gym while the others carry on.

## **Star jumps**

*Autonomy supportive:* You can choose any style of star jump you like, but most people would do them by raising both arms and jumping so that the feet are wide apart, then jumping again to bring the arms down and feet together.

*Controlling:* Start with both feet together and arms by your sides, then you have to jump so that you land with your legs far apart, with your arms in the air, and finally jump so that you bring them sharply in again.

*Neutral:* To do a star jump you start with legs together and arms by your sides, then jump so that your legs land far apart and arms are up, and finally jump so that you bring them sharply in again.

## **Lunges**

*Autonomy supportive:* Start with your legs together with your hands on your hips, then allow yourself to fall forwards a little so you catch yourself with one leg. Stay down in that position with the knee bent for a count of 4 or 5 seconds, then bring the other leg through and do it on that one.

*Controlling:* Start with your legs together with your hands on your hips, then allow yourself to fall forwards a little so you catch yourself with one leg. Stay down in that position with the knee bent for a count of 4 or 5 seconds, then bring the other leg through and do it on that one.

*Neutral:* Start with your legs together with your hands on your hips, then allow yourself to fall forwards a little so you catch yourself with one leg. Stay down in that position with the knee bent for a count of 4 or 5 seconds, then bring the other leg through and do it on that one.

## **Kicking runs**

*Autonomy supportive:* This exercise is just running very upright with your hands behind your buttocks, trying to kick them with your heels as you go forwards. You don't have to be particularly fast, it's more to stretch out the muscles here.

*Controlling:* This exercise is just running very upright with your hands behind your buttocks, kicking them with your heels as you go forwards. Don't go too fast, you have to go slow enough to make sure you make contact each time.

*Neutral:* This exercise is just running very upright with your hands behind your buttocks, trying to kick them with your heels as you go forwards.

## **Squats**

*Autonomy supportive:* To stretch some muscles this is an exercise of stretching and holding the stretch. Maybe start with your feet just over shoulder width apart, and gradually bend your knees to a squat. It's good for you to hold it there for a few seconds before gradually straightening up. You can change how far apart your feet are, and how long you hold it for, depending on how hard you want to work.

*Controlling:* Stand with your feet just over shoulder width apart, and gradually bend your knees to a squat. Hold it for 5 seconds before gradually straightening up. You have to go slowly, and keep your muscles controlled to get the most out of this exercise.

*Neutral:* Stand with your feet just over shoulder width apart, and gradually bend your knees to a squat. Hold it for 5 seconds before gradually straightening up.



**Questionnaires incorporated in Study 4**

**7.4.1 Baseline Questionnaire**

a) Motivation for Physical Education Scale

*What are the main reasons why you take part in PE? I take part in PE ...*

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. because PE is fun.	1	2	3	4	5	6	7
2. because I want to learn sport skills.	1	2	3	4	5	6	7
3. because I want the teacher to think I'm a good student.	1	2	3	4	5	6	7
4. because I'll get into trouble if I don't.	1	2	3	4	5	6	7
5. but I don't really know why.	1	2	3	4	5	6	7
6. because I enjoy learning new skills.	1	2	3	4	5	6	7
7. because it is important for me to do well in PE.	1	2	3	4	5	6	7
8. because I would feel bad about myself if I didn't.	1	2	3	4	5	6	7
9. because that's what I am supposed to do.	1	2	3	4	5	6	7
10 but I don't see why we should have PE.	1	2	3	4	5	6	7
11 because PE is exciting.	1	2	3	4	5	6	7
12 because I want to improve in sport.	1	2	3	4	5	6	7
13 because I want the other students to think I'm skilful.	1	2	3	4	5	6	7
14 so that the teacher won't yell at me.	1	2	3	4	5	6	7
15 but I really feel I'm wasting my time in PE.	1	2	3	4	5	6	7
16 because of the enjoyment that I feel while learning new skills/techniques.	1	2	3	4	5	6	7
17 because I can learn skills which I could use in other areas of my life.	1	2	3	4	5	6	7
18 because it bothers me when I don't.	1	2	3	4	5	6	7
19 because that's the rule.	1	2	3	4	5	6	7
20 but I can't see what I'm getting out of PE	1	2	3	4	5	6	7

### 7.4.2 Goal content

“What do you hope to get out of PE? Do you have a particular goal, or goals in mind when you are putting effort into a PE lesson? Please indicate below what goals, if any, you have for PE”.

### 7.4.3 Perceived autonomy support from PE

This questionnaire contains items that are related to your views about what it is like for ALL students who take PE with you at school. I would like to know more about what your PE class is usually like.

		Strongly Disagree		Neutral			Strongly Agree	
		1	2	3	4	5	6	7
1	we feel that the PE teacher provides us with choices and options.	1	2	3	4	5	6	7
2	we feel understood by our PE teacher	1	2	3	4	5	6	7
3	the PE teacher shows confidence in our abilities to do well in PE.	1	2	3	4	5	6	7
4	the PE teacher encourages us to ask questions.	1	2	3	4	5	6	7
5	the PE teacher listens to how we would like to do things.	1	2	3	4	5	6	7
6	the PE teacher tries to understand how we see things before suggesting new ways to do things.	1	2	3	4	5	6	7

### 7.4.4 Social Participation Scale

During the school year, how often *in a typical week* do you do the following: (please tick the box that best sums it up)

		Never	Occasionally	Most weeks	More than once a week
1	Play sports on a school team	1	2	3	4
2	Play in a school band, choir, orchestra, music lessons, or practice music	1	2	3	4
3	Go to clubs or organisations outside school	1	2	3	4
4	Do volunteer work or community service	1	2	3	4

### 7.4.5 School Connectedness Scale

The following questions ask about how much you feel involved in your school, and your community. Please tell us how much....

		Not at all					Very much	
1	You feel close to people at your school	1	2	3	4	5	6	7
2	You feel like you are a part of your school	1	2	3	4	5	6	7
3	You are happy to be at your school	1	2	3	4	5	6	7
4	You feel the teachers at your school treat people fairly	1	2	3	4	5	6	7
5	You feel safe at your school	1	2	3	4	5	6	7
6	You feel that your teachers care about you	1	2	3	4	5	6	7

### 7.4.6 Exercise induced feelings inventory

*How do you feel right now?*

		Do not feel	Feel Slightly	Feel Moderately	Feel Strongly	Feel Very Strongly
1	Refreshed	0	1	2	3	4
2	Calm	0	1	2	3	4
3	Fatigued	0	1	2	3	4
4	Enthusiastic	0	1	2	3	4
5	Relaxed	0	1	2	3	4
6	Energetic	0	1	2	3	4
7	Happy	0	1	2	3	4
8	Tired	0	1	2	3	4
9	Revived	0	1	2	3	4
10	Peaceful	0	1	2	3	4
11	Worn-out	0	1	2	3	4
12	Upbeat	0	1	2	3	4

### 7.4.7 *Intrinsic Motivation Inventory*

(i) *To what degree did you put effort and energy into this lesson?*

	<i>not at all true</i>		<i>Somewhat true</i>			<i>Very true</i>	
1. I put a lot of effort into this lesson.	1	2	3	4	5	6	7
2. I didn't try very hard to do well at this activity.	1	2	3	4	5	6	7
3. I tried very hard on this activity.	1	2	3	4	5	6	7
4. It was important to me to do well at this task.	1	2	3	4	5	6	7
5. I didn't put much energy into this.	1	2	3	4	5	6	7

(ii) *How much did you enjoy this lesson and find it interesting?*

	<i>not at all true</i>		<i>Somewhat true</i>			<i>Very true</i>	
1. I enjoyed doing this activity very much	1	2	3	4	5	6	7
2. This activity was fun to do.	1	2	3	4	5	6	7
3. I thought this was a boring activity.	1	2	3	4	5	6	7
4. This activity did not hold my attention at all.	1	2	3	4	5	6	7
5. I would describe this activity as very interesting.	1	2	3	4	5	6	7
6. I thought this activity was quite enjoyable.	1	2	3	4	5	6	7
7. While I was doing this activity, I was thinking about how much I enjoyed it	1	2	3	4	5	6	7

(ii) *How much did you value this lesson?*

	<i>not at all true</i>		<i>Somewhat true</i>			<i>Very true</i>	
1. I believe this activity could be of some value to me	1	2	3	4	5	6	7
2. I think that doing this activity is useful	1	2	3	4	5	6	7
3. I think this activity could help me.	1	2	3	4	5	6	7
4. I would be willing to do this again because it has some value to me.	1	2	3	4	5	6	7
5. I believe doing this activity could be beneficial to me	1	2	3	4	5	6	7
6. I think this is an important activity	1	2	3	4	5	6	7

### 7.4.8 Situational Motivation Scale

Please read each item carefully. Using the scale below, please circle the number that best describes the reason why you are taking part in this circuits class:

		<i>not at all</i>	<i>very little</i>	<i>a little</i>	<i>Moder- ately</i>	<i>enough</i>	<i>a lot</i>	<i>exactly</i>
1.	Because I thought that this circuits class was interesting	1	2	3	4	5	6	7
2.	Because I was doing it for my own good	1	2	3	4	5	6	7
3.	Because I wanted the teacher to think I'm a good student	1	2	3	4	5	6	7
4.	Because I was supposed to do it	1	2	3	4	5	6	7
5.	There may have been good reasons to do this circuits class, but personally I didn't see any	1	2	3	4	5	6	7
6.	Because I thought that this circuits class was pleasant	1	2	3	4	5	6	7
7.	Because I thought that this circuits class was good for me	1	2	3	4	5	6	7
8.	Because I would feel bad about myself if I didn't try	1	2	3	4	5	6	7
9.	Because it is something that I had to do	1	2	3	4	5	6	7
10.	I did this circuits class but I am not sure if it was worth it	1	2	3	4	5	6	7
11.	Because this circuits class was fun	1	2	3	4	5	6	7
12.	By personal decision	1	2	3	4	5	6	7
13.	Because I wanted the other students to think I'm good at it	1	2	3	4	5	6	7
14.	Because I didn't have any choice	1	2	3	4	5	6	7
15.	I don't know; I don't see what this circuits class brought me	1	2	3	4	5	6	7
16.	Because I felt good when doing circuits	1	2	3	4	5	6	7
17.	Because I believed that this circuits class was important for me	1	2	3	4	5	6	7
18.	Because it bothers me when I don't try	1	2	3	4	5	6	7
19.	Because I felt that I had to do it	1	2	3	4	5	6	7

20.	I did this circuits class, but I am not sure it was a good thing to pursue	1	2	3	4	5	6	7
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### 7.4.9 Perceived Autonomy Support

*In this PE class...*

		Strongly Disagree		Neutral			Strongly Agree	
1	I felt that the instructor provided us with choices and options.	1	2	3	4	5	6	7
2	I felt understood by our instructor	1	2	3	4	5	6	7
3	the instructor showed confidence in our abilities to do well in PE.	1	2	3	4	5	6	7
4	the instructor encouraged us to ask questions.	1	2	3	4	5	6	7
5	the instructor listened to how we would like to do things.	1	2	3	4	5	6	7
6	the instructor tried to understand how we see things before suggesting new ways to do things.	1	2	3	4	5	6	7

### 7.4.10 Perceived Goal focus

*In this lesson:-*

	Not at all	neutral			extremely			
1.	The main focus was to improve my health and fitness	1	2	3	4	5	6	7
2.	The main focus was to make me feel more awake and energetic.	1	2	3	4	5	6	7
3.	It wasn't intended that I 'd get anything in particular out of it	1	2	3	4	5	6	7
4.	The focus was to help me to stay slim and look better	1	2	3	4	5	6	7
5.	The focus was to control my weight and improve how I look	1	2	3	4	5	6	7
6.	There was no particular focus as to what I should get out of this lesson	1	2	3	4	5	6	7
7.	Doing this workout was mainly intended to help control my weight and improve the way I look.	1	2	3	4	5	6	7
8.	Doing this workout was not for any particular purpose	1	2	3	4	5	6	7

9. Doing this workout was mainly intended to help my fitness, and make me feel more energetic.	1	2	3	4	5	6	7
--	---	---	---	---	---	---	---

**7.4.11 Intention**

*If this circuits class was available at lunchtimes or after school, how interested would you be in joining in?*

Not at all interested, definitely wouldn't try it	Not very interested, very unlikely to try it	unlikely to try it	Not sure	Quite interested, I'd think about trying it	Fairly interested, I'd be likely to try it	Extremely interested, I would definitely want to take part
1	2	3	4	5	6	7



### Letters to parents in Study 4



#### Further Information

If you have any queries regarding this study please contact  
Fiona Gillison  
Tel: 01225 386696

#### School for Health

Dear Parent,

The pupils at your child's school have been invited to take part in a research study conducted by my colleagues and me from the University of Bath. Before you decide whether you would be happy for your child to take part, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish.

School physical education (PE) is thought to be a good opportunity to increase physical activity levels (during the school years and beyond) and improve psychological health. However, exercise levels tend to drop rapidly at around your child's age, and it is often the case that once levels fall they remain low throughout the rest of life. We are therefore carrying out a study to explore ways of keeping pupils interested in exercise and physical activity for longer, through targeting their motivation. This study involves testing the effects of changes to a PE lesson. All that would be involved on your child's part in addition to their usual PE lesson is the completion of a number of questionnaires. We think this work is important, and may help health professionals and educators to increase adolescent exercise levels. In addition, we think this research will be of interest to those pupils who do decide to take part.

#### Procedure

Pupils will be given the option of taking part in a special PE lesson, run in their usual PE time slot but by researchers at the University of Bath. Those wishing to take part will be asked to complete a short questionnaire one week beforehand, and then immediately before and after PE. The lesson will be supervised by your child's usual PE teacher, and will involve activities similar to those they are familiar with, and at an intensity which they choose and are comfortable with.

This research has been passed by the Bath University Ethics Committee. All responses will remain confidential and anonymous; we will not record your child's name on any questionnaire, and all data will be stored in locked cabinets at the University of Bath.

*You may like to discuss with your child whether or not they are happy to take part. If you, or your child would prefer that they not take part, they will be offered an alternative PE lesson with other members of their year group.*



**IMPORTANT**

This research is entirely optional, and your child’s schooling will not be affected in any way if they, or you, choose not to take part. Your child will have the option to withdraw at any time, before or during the research, without needing to provide a reason. ***If you are happy for your child to take part, then you need take no further action. However, if you would prefer your child not to take part please complete and return the form attached.***

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**Reply Form**

**University of Bath Research Project  
Motivation for Exercise**

Please complete and return if you would prefer your child **NOT** to take part in this research.

(If you are happy for your child to take part you need not send this form back.)

I would prefer my child ..... (name)  
not to take part in the research.

**Please sign below:**

Signature .....

Date .....

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**Further Information**

If you have any queries regarding the present study please contact Fiona Gillison (Tel: 01225 384323; email: F.B.Gillison@bath.ac.uk).

### Teacher protocol for Study 4

This study is looking at aspects of the 'climate' of a PE lesson and how it affects pupils' motivation. We have purposely chosen a lesson that we don't think the pupils will find particularly fun or interesting, as we are looking at the processes by which people motivate themselves to take part in activities which may be of importance, but may not be inherently interesting.

The study will be run as a randomised controlled trial. This means that students in each session will be randomly allocated to a different experimental condition, and that neither you the teachers, nor the students will be aware of which condition they are in. Only one single class sized group (i.e. 25-30 pupils) will be involved at any one time, and it is hoped that all pupils in the year group will have a chance to participate at some stage. All conditions will involve taking part in the same activity, a circuits class, the only difference will be the way in which the lesson is presented to the students. This means it is extremely important that we are consistent with what is said to pupils, and more importantly how it is said within each lesson and condition, in order for the research to be useful.

To standardise this and make this simple, the session itself will be run by researchers at the University of Bath, who will read the instructions from a script. The researcher will introduce the lesson plan, demonstrate the exercises, and provide feedback and support to pupils during the task, all in line with this exact scripted format. It would be really useful for us to have the help of school staff in making sure the lesson goes smoothly, but to minimise the effects on the research that would result from different teachers having different styles of working with students, we would ask that the teachers present stick to a protocol when speaking to students during the session too.

This protocol is one that is designed to be neutral, i.e. will apply for any condition regardless of randomisation;

- 1) The success of this research relies on us being able to ensure that all participants in each condition get the exact treatment intended. So, although it may sound a bit unnatural, please avoid interacting with pupils at all during this session unless it is necessary to so. This way we can better ensure that all pupils get the same treatment, and each group is sharply different.
- 2) Please avoid rephrasing the instructions given by the researcher, as this may dilute the message given. Written instructions will be present at each work station, so should pupils ask you what they should be doing, we would ask you to read these out exactly as stated on the sheet. If pupils ask for further clarification, please ask the researcher to come and do this, however quick and easy it may seem to do so yourself. A useful phrase could be "I'm not quite sure, so I'll ask Fiona to show you"
- 3) Please avoid providing even very general encouragement or feedback to pupils. This is one of the factors that we will be studying, so it is important that this too is controlled by the researcher. If pupils ask for feedback, again please answer along the lines of "I'm not sure, so I'll ask Fiona to let you know" and ask the researcher to provide further clarification.
- 4) We don't necessarily expect it to happen, but if pupils stop working or are not putting much effort in, then please allow them to do so without comment. This is for two reasons. Firstly, as it is a research project we have to ensure that pupils retain the right to withdraw at any time. Secondly, dropping out in itself is a very useful indicator of what the pupils think of a given session.

Finally, at the end of the session we will be seeking your opinions of how the lesson felt to you, as an observer. This will help us to ascertain whether our objective in manipulating the 'climate' of the lesson succeeded or not.

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## **Refresher of Protocol for distribution on the day of the trial**

- 1) Please avoid communicating with pupils at all during the lesson
- 2) If pupils approach you, please tell them "I'm not quite sure, so I'll ask Fiona to show/tell you"
- 3) Please DO NOT rephrase any of the instructions for pupils, or provide any additional information. All information should be given to pupils exactly as it is written on the researcher's script.
- 4) Please avoid providing even very general encouragement or feedback to pupils.
- 5) Allow pupils to stop working without comment if this occurs.

***If in doubt, try "I'm not exactly sure, I'll ask Fiona to help you."***



## Appendix 7.7

### Preliminary analysis of group level effects on outcome variables by randomisation group

	Group 1 AS, SR N=101	Group 2 C, SR N=90	Group 3 AS, EGR N=95	Group 4 C, EGR N=119	Group 5 N N=101	Preliminary ANCOVA <sup>a</sup> significant effects
<b>Behavioural</b>						
Effort	4.88 (1.25)	5.11 (1.05)	4.77 (1.32)	5.15 (1.19)	5.20 (1.26)	$F(11,467)=11.90, p<.001$ Significant predictors: <ul style="list-style-type: none"> <li>• Condition: 2 &amp; 4 significantly &gt; expected</li> <li>• Interaction effect: group 1 (male&gt;female)</li> <li>• Covariates (RAI and connectedness)</li> </ul>
<b>ICC= .04</b>						
Intention	3.79 (1.66)	4.03 (1.86)	3.86 (1.75)	4.30 (2.09)	3.82 (2.08)	$F(11,406)=5.99, p<.001$ Significant predictors: <ul style="list-style-type: none"> <li>• Condition: 4 significantly &gt; expected</li> <li>• Covariates (RAI and connectedness)</li> </ul>
<b>ICC= .01</b>						
<b>Need Satisfaction</b>						
Autonomy	4.65 (1.37)	3.23 (1.23)	4.88 (1.37)	3.30 (1.27)	3.35 (1.43)	$F(11,467)=26.40, p<.001$ Significant predictors: <ul style="list-style-type: none"> <li>• Condition: 1 &amp; 3 significantly &gt; expected, condition 4 &lt; expected</li> <li>• Covariates: contextual autonomy, connectedness</li> </ul>
<b>ICC= .27</b>						
Competence	5.07 (1.15)	4.89 (1.05)	4.96 (1.19)	5.36 (1.00)	5.16 (1.16)	$F(11,467)=16.03, p<.001$ Significant predictors: <ul style="list-style-type: none"> <li>• Condition: no specific groups differ</li> <li>• Interaction: A &amp; C; male&gt;female</li> <li>• Covariates: contextual competence, connectedness</li> </ul>
<b>ICC= .08</b>						
Relatedness	4.82 (1.31)	4.58 (1.32)	4.82 (1.31)	4.57 (1.28)	4.80 (1.38)	$F(11,467)=11.59, p<.001$ Significant predictors: <ul style="list-style-type: none"> <li>• Interaction: conditions 1, 2 &amp; 3: females report poorer gains in relatedness</li> <li>• Covariates: contextual relatedness, connectedness</li> </ul>
<b>ICC= .11</b>						

	Group 1 AS, SR N=101	Group 2 C, SR N=90	Group 3 AS, EGR N=95	Group 4 C, EGR N=119	Group 5 N N=101	Preliminary ANCOVA <sup>a</sup> significant effects
<b>Cognitive</b>						
Value	4.43 (1.60)	4.31 (1.52)	4.42 (1.59)	4.83 (1.60)	4.38 (1.80)	$F(11,467)=10.92, p<.001$ Significant predictors: • Interaction effect: group 1 (male>female) • Covariates (RAI and connectedness)
<b>ICC= .04</b>						
<b>Affective</b>						
Enjoyment	4.22 (1.51)	4.14 (1.17)	4.20 (1.29)	4.32 (1.38)	4.28 (1.66)	$F(11,467)= 10.08, p<.001$ Significant predictors: • Condition: 4 significantly > expected • Covariates (RAI and connectedness)
<b>ICC= .04</b>						
<b>Motivational</b>						
Amotivation	3.10 (1.23)	3.07 (1.29)	2.61 (1.20)	2.53 (1.36)	3.08 (1.66)	$F(11,467)=7.92, p<.001$ Significant predictors: • Condition: 3 & 4 significantly < expected • Covariate; time 1 amotivation, connectedness
<b>ICC= .07</b>						
external regulation	4.11 (1.48)	4.36 (1.49)	3.56 (1.47)	4.21 (1.55)	4.43 (1.49)	$F(10,468)=9.01, p<.001$ Significant predictors: • Condition: 1 & 3 significantly > expected • Gender: female<male • Covariates: time 1 extrinsic regulation
<b>ICC= .09</b>						
introjected regulation	3.98 (1.63)	3.64 (1.50)	3.74 (1.46)	3.85 (1.43)	3.66(1.56)	$F(12,466)=11.03, p<.001$ Significant predictors: • Covariates: time A introjected regulation, usual perceived autonomy support
<b>ICC= &lt;.01</b>						
identified regulation	4.41 (1.45)	3.87 (1.42)	4.32 (1.42)	4.48 (1.34)	4.18 (1.52)	$F(12,466)=10.32, p<.001$ Significant predictors: • Covariates: time 1 identified regulation, usual perceived autonomy support
<b>ICC= .03</b>						
intrinsic motivation	4.06 (1.53)	3.91 (1.35)	4.06 (1.41)	4.23 (1.37)	4.08 (1.46)	$F(11,467)=8.41, p<.001$ Significant predictors: • Covariate: time 1 intrinsic regulation, connectedness
<b>ICC= .02</b>						

Notes: <sup>a</sup> following significant MANCOVA analyses for need satisfaction and motivational outcomes;  
AS = autonomy support climate, C = controlling climate, SR = standard rationale, EGC = extrinsic goal rationale, N = neutral/no goal content

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