
**Investigating, designing and developing obesity
management education within medical schools**

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degree of Doctor of Philosophy (PhD) in the Faculty of
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Anna Chisholm

School of Psychological Sciences

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Thesis abstract

Anna Chisholm, The University of Manchester
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Degree title: Doctor of Philosophy (PhD)

Thesis title: Investigating, designing and developing obesity management education within medical schools

Objectives: Obesity-related illnesses are a major public health concern. Although doctors are expected to discuss obesity and health-related behaviour change with patients, they report being unprepared by medical education to do this effectively. Healthcare settings provide an opportunity to help patients tackle unhealthy behaviours and make the necessary changes to improve their health and longevity. This programme of research aims to investigate and improve current obesity management education for medical students. It also aims to identify whether the existing evidence-base on behaviour change techniques has been used to inform educational interventions in this area. Five separate studies were conducted in order to investigate obesity management education for medical students, identify challenges and solutions to its integration within medical schools, and then design and test a novel educational intervention in this area.

Methods: Two systematic reviews were conducted to investigate relevant educational interventions about obesity management in terms of a) their efficacy and b) their educational content. A qualitative study using semi-structured interviews with medical educators (n = 27) was conducted to explore key challenges to integrating this education into medical schools in Ireland and the UK. The final two studies involved designing and validating a communication tool based upon behaviour change techniques, and subsequently evaluating this within an educational intervention in a before-and-after feasibility study (n = 34 medical students).

Results: Findings from the systematic reviews illustrated that educational interventions addressing obesity management for medical students are rare. Robust empirical evaluations are scarce, and on the whole authors report using little behaviour change theory or evidence to inform their interventions. Barriers to integrating obesity management education into medical schools may relate to the diverse and opportunistic manner in which it is currently delivered within medical schools; varied support for its inclusion, and varied medical student engagement in the topic. Taking into account these issues, findings of the feasibility study suggest that it is possible to deliver theory- and evidence-based obesity management education to medical students. This educational intervention was delivered consistently by clinical tutors, it was acceptable and valued by students, and results suggest that participants would go on to discuss obesity management with patients and use desired communication skills within such interactions.

Conclusions: The available evidence-base on obesity management educational interventions for medical students is poor. However, it is possible to design and deliver this education within an existing undergraduate medical programme. Further research is required to investigate the efficacy and effectiveness of such an intervention in practice.

Declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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Rationale for submitting the thesis in the alternative format

The alternative format used in this thesis was suited to the present programme of research for a number of reasons. Firstly, the studies that make up this thesis have been designed to allow for individual empirical research papers to be produced. Secondly, the student has focused on publishing scientific papers since the PhD commenced. This has resulted in success with one paper (see Chapter 5) which was accepted for publication in a peer reviewed journal (Academic Medicine). Three others are under review with various journals and one is in preparation. Due to the progress made early on in this PhD regarding designing and submitting research papers, it was believed that it would be more sensible and efficient to submit the thesis in the alternative format.

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I wish to thank my supervisors Sarah Peters, Jo Hart, Karen Mann, and advisor Alison Wearden for their continued support throughout my PhD. They have given me invaluable advice and guidance throughout and helped me find countless opportunities to further my career and to develop personally.

I would also like to thank my friends and family who have supported me over the last three and a half years, especially my Mum and brother Rory who have spent a lot of time getting their heads around the studies I've carried out. Thank you as well to Phil for putting up with me, Grandad for his words of wisdom, and Grandma for her writing advice. Special thanks also go to Sam Rowbotham and Mel Noke who have been a huge source of support and have been fantastic to have nearby throughout.

Dedication

This thesis is dedicated to the memory of my Dad, Ian Chisholm. He would have loved to have seen this, love you pa.

List of abbreviations

BCT – *Behaviour change technique*
BMI – *Body mass index*
CHD – *Coronary heart disease*
CI – *Confidence intervals*
CRD – *Centre for Reviews and Dissemination*
DCV – *Discriminant content validity*
GMC – *General Medical Council*
HBCC – *Health behaviour change competency framework*
HBM – *Health belief model*
ICC – *Intraclass correlation*
IMP – *Implementation intentions*
IPA – *Interpretive phenomenological analysis*
MAP – *Motivation development; action on motivation; prompted or cued behaviour*
MI – *Motivational interviewing*
MRC – *Medical Research Council*
NCDs – *Non-communicable diseases*
NHS – *National Health Service*
NICE – *National Institute for Clinical Excellence*
OME – *Obesity management education*
OSCE – *Objective Structured Clinical Examination*
PBC – *Perceived behavioural control*
PICOS – *Population; intervention, comparators, outcomes, study design*
RCT – *Randomised controlled trial*
SCT – *Social cognitive theory*
SIGN – *Scottish Intercollegiate Guidelines Network*
TACT – *Target; action, context, time*
Tent Pegs – *Taking down barriers; changing the ENvironment; addressing Thoughts and emotions; Perform and practice; Empowering people to change; achieving Goals; Social support*
TD – *Tomorrow's doctors*
TPB – *Theory of planned behaviour*
TTM – *Transtheoretical model of behaviour change*
UK – *United Kingdom*
US – *United States*
WHO – *World Health Organisation*

SECTION ONE: INTRODUCTION

Introduction to research studies and thesis structure

This thesis includes a series of studies that make up a programme of research broadly focusing upon behaviour change communication by medical students, within the context of obesity. It considers how medical education should prepare future doctors to work with patients on managing the behaviours that cause and maintain obesity. Obesity is an increasingly prevalent issue that decreases both health and longevity, putting healthcare systems under unnecessary strain. As it is preventable behaviours (eating and activity patterns) that ultimately determine obesity status, it is important that medical professionals are adequately equipped to facilitate the necessary behavioural changes with patients. This thesis considers the role of undergraduate medical education in preparing future doctors for this task. Herein the term obesity management will refer to behaviours and aspects of individuals' lifestyles as targets for intervention, rather than pharmacological or surgical obesity management methods. Each study included within this thesis aims to add to current understanding about effective methods of developing and delivering obesity management education for medical students. Furthermore, as this thesis is presented in the alternative format, each chapter will either contain a thesis sub-section or a journal article. This will be clearly labelled at the beginning of each chapter. Journal articles will be presented in formats appropriate for submission to a particular peer reviewed journal and their submission status will be stated (e.g. published or under review). Thesis sub-sections are not written in the style of an empirical paper; they instead provide description or discussion of the relevant literature and/or thesis studies.

The author (AC) led the conduct and write up of all journal articles and thesis sections within this thesis. This included taking primary responsibility for designing and setting up studies, recruiting participants, and collecting and analysing data. Thus, the lead author managed ethical approval procedures, liaised with research site organisations/individuals, independently contacted study participants, arranged and carried out data collection, and planned and carried out all initial analyses of the data. Collaborating authors named on the journal articles within this thesis

additionally contributed to studies through assisting with study conceptualisation and decision making during studies (e.g. discussions around modifying sampling strategies or analytical approaches), as well as secondary analysis tasks such as second coding datasets and contributing to inter-rater reliability procedures. Regarding written dissemination of this research, the lead author independently drafted all sections of this thesis, including all journal articles and collaborating authors also all contributed to the development of subsequent manuscript versions through group discussion and suggested modifications. More specific detail regarding individual authors' contributions are noted within each journal article (Chapters 5 – 10).

Section one includes Chapters 1-4; all of which contain thesis sub-sections. It introduces and provides a detailed background of relevant subject areas including (1) Health behaviours and obesity: Relevance to society and healthcare systems, (2) Approaches to combating obesity and mechanisms for change, (3) Obesity management by healthcare professionals. This section ends with an overview of the main research aim and objectives, and summarises the study designs and methods used within this thesis (Chapter 4).

Section two presents three studies which identify the characteristics of current obesity management education. The first study (Chapter 5; journal article) comprises a systematic review which investigates the extent to which empirical evidence has contributed to the development and delivery of obesity management education. The second study (Chapter 6; journal article) builds on this by identifying whether educational interventions in this area describe theory-based behaviour change techniques within intervention descriptions. Both these systematic reviews follow the standardised PICOS (Population, Intervention, Comparators, Study Design) framework for guiding the search strategy and eligibility criteria in order to select relevant articles into the studies. The final study in this section (Chapter 7; journal article) explores current challenges and possible solutions to implementing obesity management education. It explores these issues by eliciting experiences and views of those involved in curriculum design and delivery within UK and

Irish medical schools. Semi-structured telephone interviews were conducted with participants to elicit a rich dataset regarding their view and experiences and these were analysed using Grounded Theory principles.

Drawing upon these study findings, Section three describes the development and evaluation of an educational intervention aiming to prepare medical students' for obesity management discussions with future patients. Three chapters within this section report different elements of this process. Chapter 8 (journal article) describes the development of a behaviour change communication tool for medical education. Within this study, behaviour change techniques were identified from relevant literature and systematically included or excluded so that the most appropriate and relevant techniques were selected into the medical education tool. Discriminant content validity methods were then used to test the structure and organisation of techniques within the tool. Chapter 9 (thesis sub-section) explains the research design and procedures involved in developing an educational intervention involving this tool. Within this chapter an in-depth reflection of the research process is discussed rather than a full outline of the intervention study that was conducted. Chapter 10 (journal article) describes the delivery and evaluation of the educational intervention in full. This includes a mixed methods analysis of its efficacy, feasibility and acceptability within a medical school setting. Efficacy was investigated through a questionnaire assessing change in medical students' behavioural intentions and communication skills. Feasibility and acceptability were investigated through a fidelity analysis of session audio-recordings, and written student feedback (respectively).

Finally, Section four summarises all the studies' findings, considers their contribution to the existing literature, their implications for medical education and health psychology, and suggests areas for future research (Chapter 11; thesis sub-section). In order to maintain coherence and clarity throughout, each section will also include a general introduction at the beginning and a summary at the end.

Chapter 1: Health behaviours and obesity: Relevance to society and healthcare systems

(thesis sub-section)

1.1 Lifestyle-related illnesses

The most prevalent illnesses in modern society are non-communicable diseases (NCDs) such as heart disease, stroke, cancers, respiratory diseases and diabetes (World Health Organisation; WHO, 2008a; 2008b). Over the last 100 years, these chronic illnesses have replaced acute infectious diseases such as diphtheria, pneumonia and measles as society's biggest killers (Adshead & Thorpe, 2006; Ogden, 2000). Importantly, these have been categorised as lifestyle-related illness due to their associations with behaviour rather than infectious disease (Adshead & Thorpe, 2006; Department of Health, 2004; Ogden, 2000). This shift in disease patterns has prompted investigations into the impact upon global health. The WHO (2008a) has estimated that these NCDs are now responsible for 60% of the world's annual mortality (35 million people annually) and further, that they cause 80% of all deaths in middle and low income countries.

Although NCDs have to this point dominated morbidity and mortality in developed countries, concerns now extend to developing countries which are expected to experience similar increases in the near future (Wise, 2011). The greatest rise in NCD deaths over the next decade is actually estimated to occur in the African and East Mediterranean regions (by 27% and 25% respectively) (WHO, 2008a). As these diseases are characteristically chronic, individuals may be required to manage their conditions for significant proportions of their life. Traditional definitions describing *health* as the 'absence of disease' or 'complete physical, mental and social wellbeing' therefore no longer suffice as these would render most of the population as permanently unhealthy (Godlee, 2011). Individuals today cannot often be categorised dichotomously, as either ill (e.g. suffering from an acute illness) or healthy. Thus, the growing long-term illness epidemic has instead led to a new definition conceptualising health as "the ability to adapt and self manage in the face of social, physical and emotional challenges" (Godlee, 2011, p. 4817).

This emphasis upon adaptation and self-management indicates the potential to prevent ill health especially NCDs, because they are closely associated with modifiable behaviours such as unhealthy diets, physical inactivity, tobacco use and harmful use of alcohol (WHO, 2008a). Thus the modification of such behaviours can contribute to facilitating successful management and prevention of NCDs. Despite this, health-related behaviours remain responsible for many premature deaths. For example, each year smoking directly causes 443, 000 premature deaths in the US (National Center for Chronic Disease Prevention and Health Promotion, 2011) and 80, 000 in the UK (Department of Health, 2010c). In 2005, alcohol consumption was responsible for 3.1% (n = 14, 982) of all deaths in England (Jones, Bellis, Dedman, Sumnall, & Tocque, 2008), and recent reports suggest these rates continue to rise (Department of Health, 2010b). There is also particular concern for 16-24 year olds as alcohol-related accidents were shown to account for the majority of deaths in this group (Jones et al., 2008). Obesity is known to be responsible for increases in various illnesses including asthma, diabetes and coronary heart disease (CHD) and is now often referred to as a worldwide epidemic (e.g. Alpert & Powers, 2005; Counterweight Project Team, 2008; Treyzon, 2005; Wise, 2011).

Importantly however, research indicates that if modification of these behaviours is achieved, the development of lifestyle-related illnesses can be delayed and their effects reduced (Steyn, Lambert, & Tabana, 2009). It is suggested that as much as 80% of heart disease, stroke, Type II diabetes and one third of cancer could be avoided with the appropriate changes in lifestyle such as stopping smoking, decreasing alcohol use, increasing exercise, and improving diet (WHO, 2008a). There is robust evidence that changes to smoking, obesity status, physical activity, fruit and vegetable and alcohol consumption can protect individuals from CHD, which is the world's leading cause of death and disability (Yusuf et al., 2004). Specifically, data from this large international case-control study (including 15,152 cases and 14,820 controls representing 52

countries) found that nine modifiable lifestyle factors accounted for over 90% of the risk of experiencing an initial acute myocardial infarction (Yusuf et al., 2004).

Together, this evidence demonstrates the role of lifestyle and behaviours in contemporary illness and indicates that preventing and controlling unhealthy behaviour is fundamental to improving global health. Numerous health behaviours (like those above) are sometimes grouped together, for example, by research aiming to identify behavioural determinants within theories (Noar & Zimmerman, 2005), explore barriers to health behaviour communication (Chisholm, Hart, Lam, & Peters, 2012), or consider optimal methods of intervention (Calderon, Balague, Cortada, & Sanchez, 2011). However, health behaviours are likely to be qualitatively different from one another. This is reflected by differing patterns of prevalence for example, when contrasting the rising incidence of obesity- and alcohol-related illness with decreasing incidence of smoking and smoking-related illness (Department of Health, 2010b; Withrow & Alter, 2011). It may also be that health behaviours are influenced by different factors and this is reflected by the development of behaviour-specific theories such as those focusing purely on safer sex or alcohol consumption (see Noar & Zimmerman, 2005). Furthermore, research shows that the deleterious effects of obesity supersede those of smoking or alcohol in terms of costs to patients' health and healthcare services (Sturm, 2002). For these reasons, the present thesis focuses upon obesity as an exemplar of one lifestyle factor that is a consequence of health-related behaviours with current and significant influence upon population health.

1.2 Obesity specific consequences

Obesity as a condition has a number of consequences, both for individuals and organisations. The following paragraphs discuss how obesity affects individuals' physical health as well as their psychological and social wellbeing. The additional impact upon healthcare systems financially, and in terms of their workload, is also considered.

1.2.1 Physical health implications of obesity

Obesity is defined as excess body fat sufficient to cause reduced health or longevity (David et al., 2008) and is determined by an imbalance between energy expenditure (physical activity) and energy intake (consumption) (Jebb, 1999). Although many operational definitions of obesity classify the condition as a Body Mass Index (BMI) of $\geq 30\text{kg/m}^2$, some recommend using other measures that may correlate more closely with morbidity, such as waist circumference and waist-to-hip ratio (Poirier, 2007). Regardless of how obesity is classified, all these methods indicate positive associations between excess fat increases and morbidity and mortality (David et al., 2008).

Obesity has recently been highlighted as remaining largely resistant to public health efforts as it has not reduced in prevalence, unlike other health problems such as tobacco use, injuries and infectious diseases which have been more successfully addressed throughout the globe (Swinburn et al., 2011). Now labelled a worldwide epidemic (Counterweight Project Team, 2005; Treyzon, 2005), over one billion adults are estimated to be overweight and half a million expected to die each year from related diseases in Western Europe and North America alone (WHO, 2002). Estimates by the English National Audit Office (2001) suggest that on average, obesity reduces life expectancy by nine years. This is of particular concern as within the UK, the condition grew by 400% between 1979 and 2004 (House of Commons Health Committee, 2004), and 68% of UK males and 64% of UK females are now estimated to be obese or overweight [BMI \geq 25 kg/m²] (WHO, 2010).

The rises in obesity-related co-morbidities are also concerning. For example, major health-related consequence of obesity is the rising incidence of type 2 diabetes (Han, Lawlor, & Kimm, 2010) with predictions that 100 million more individuals worldwide will develop the disease in the next 15 years (Steyn et al., 2009). Recently, research has also highlighted the role of obesity in the onset of fatty liver disease, an often fatal disease associated with 6-11% survival rates at 5 years (Larsson & Wolk, 2007). Further, obesity directly contributes to many other chronic illnesses

including arthritis, various cancers and cardiovascular diseases (Katz & Faridi, 2007).

Hypertension, which contributes substantially to the development of cardiovascular diseases is also associated with obesity and is particularly prevalent in low and middle income countries, and among obese children and adolescents (Ferrannini & Cushman, 2012; Ibrahim & Damasceno, 2012). It may even be the case that global increases in obesity-related behaviours including high consumption of fat, salt and alcohol, and increased sedentary lifestyles, curtail previous achievements made in treating cardiovascular diseases (Ferrannini & Cushman, 2012; Ibrahim & Damasceno, 2012). Thus, there is now a particular emphasis on preventative efforts targeting lifestyle risk factors rather than relying on other treatment approaches (e.g. pharmacology).

1.2.2 Psychological and sociological consequences of obesity

As well as having direct health implications, obesity is also known to impact upon individuals' psychological and sociological wellbeing. However, the effects of obesity upon psychological morbidity and vice versa are less clear than the association between obesity, and morbidity and mortality (Atlantis & Baker, 2008). Some research has suggested that proposed associations between obesity and depression are accounted for by biological causal pathways such as dysregulation of the hypothalamic-pituitary-adrenocortical system, although this is not evident in all individuals with both conditions (Bornstein, Schuppenies, Wong, & Licinio, 2006; Stunkard, Faith, & Allison, 2003). Other research found that levels of depression significantly reduced in obese participants (BMI = 34 – 75kg/m²) up to four years following weight loss surgery (Dixon, Dixon, & O'Brien, 2003). These findings however, can only be generalised to severely obese individuals seeking to lose weight via surgery. This group were acknowledged by the authors to potentially be encountering greater physical and psychosocial distress compared to other depressed and obese individuals.

The obesity-depression relationship is further complicated by large scale cross-sectional survey data (n = 39,695) which suggests that the association is stronger for females than males, as well as

for those with greater BMIs [$> 40\text{kg/m}^2$] (Onyike, Crum, Lee, Lyketsos, & Eaton, 2003). A systematic review also identified that evidence in this area is weak with most research supporting the obesity-depression relationship being cross-sectional studies from the USA, and that evidence often has high risk of bias and limited generalisability (Atlantis & Baker, 2008). Hence, although there is a body of research highlighting the potential association between obesity and psychological morbidity, firm conclusions about this association cannot be made without more robust empirical evidence.

Another concept with more consistent support for its influence upon psychological and sociological factors is weight stigma, defined as “the experience of being subjected to negative weight-related stereotypes and discrimination” (Hilbert, 2010, p. 5). Weight stigma within the context of obesity is associated with various social consequences such as reduced social participation in sports and discrimination within child-parent relationships (Danielsdottir, O'Brien, & Ciao, 2010). It also has repercussions for physical and mental health and is related to disordered eating behaviours, depression, anxiety, low self-esteem, and decreased quality of life (Puhl & Heuer, 2009). Furthermore, interpretative phenomenological analysis (IPA) of interviews with women ($n=10$) who had successfully lost and maintained weight reductions, revealed that a shift in identity had occurred from a previously *restrained self* towards a *liberated self* (Epiphaniou & Ogden, 2010). This identity shift was also reportedly related to a variety of psychosocial factors including improved social interactions, dietary habits, emotional regulation and self-appraisal.

Negative attitudes towards obesity are ingrained within society and have proven challenging to address through intervention, largely because implicit attitudes are strong and difficult to reverse (Danielsdottir et al., 2010). This is further illustrated by the observation that weight stigma is also apparent within healthcare settings. Research demonstrates both implicit and explicit anti-fat biases by doctors (Jay et al., 2009; Sabin, Marini, & Nosek, 2012). Regarding explicit attitudes, doctors have reported viewing obese patients as awkward, unattractive, non-compliant, weak-

willed and lazy (Foster, Wadden, Makris, Davidson, & Sanderson, 2003). Nursing students also report witnessing judgemental and discriminatory attitudes of qualified nurses towards obese patients, and suggest that these attitudes impact upon patients' healthcare experiences (Keyworth, Peters, Chisholm, & Hart, 2012). Hence, research indicates that healthcare professionals share the negative attitudes and stereotypes towards obesity held by wider society (Foster et al., 2003; Keyworth et al., 2012; Sabin et al., 2012). Together, this evidence suggests that obesity not only exposes individuals to physical illness but also to potentially harmful psychosocial consequences.

1.2.3 Healthcare systems consequences

The sub-sections above highlight that obesity-related consequences are not only mounting in relation to disease burden and psychological wellbeing but they also permeate healthcare settings. In addition there are direct financial and workload consequences for healthcare systems. NHS England for example, spends £0.5 billion per year on obesity treatments and the wider cost to the economy was estimated to be £3.6 billion in 2010 (National Audit Office, 2001). Recent reports also suggest that one sixth of the US health budget is spent on obesity-related illnesses (Lenzer, 2010). When looking at countries across the globe, a systematic review found that on average, 0.7 to 2.8% of a country's total healthcare expenditure is accounted for by obesity and that medical costs are 30% higher in obese individuals compared to patients with a BMI under 25kg/m² (Withrow & Alter, 2011). Thus, despite being regarded as preventable due to being caused and maintained by behaviours, obesity is a growing health concern related to the most prevalent illnesses in society. Successful initiatives combating obesity would therefore mitigate significant drains on healthcare system costs and resources as well as reduce a major health burden on society.

1.2.4. Summary of rationale for studying obesity

A number of obesity-related consequences are outlined above and illustrate specific reasons as to why obesity should be considered as a unique topic, warranting tailored empirical investigations

compared to other potentially similar health-related behaviours (e.g. smoking, alcohol, diet, exercise). Obesity differs from other major public health issues such as smoking and injury prevention, because there are currently no existing exemplar populations within which rising obesity trends have been reversed (Swinburn, et al., 2011). Not only is obesity prevalence increasing worldwide but it can also seriously affect individuals' health through numerous systems in the human body (Katz & Faridi, 2007). As obesity is a recognised health-related behaviour change topic) it can be seen as comparable with other topics such as smoking, alcohol consumption and medication adherence (Alpert & Powers, 2005). For example, the various behaviour change topics mentioned above lend themselves towards health promotion initiatives or illness prevention approaches (Calderon et al., 2011). Additionally they are often targeted within the literature using similar behaviour change strategies (Michie, et al., 2013). However, obesity can also be seen as a distinct topic because it is an *outcome* of health-related behaviours rather than a *behaviour* itself. Obesity instead is governed by multiple behaviours including dietary and physical activity patterns. This in itself demonstrates its multi-factorial nature compared to individual behaviours (e.g. exercise or smoking). In addition to this, obesity is also associated with significant psychological and social consequences which are likely to be related to its socially sensitive nature and tendency to results in stigmatisation. Thus challenges specifically related to facilitating *obesity-related* behaviour change may exist. For example, when considering consultations in healthcare settings, doctors may find it more challenging to raise the topic of obesity compared to others, and may worry about avoid causing offense to patients (Chisholm, Hart & Lam et al., 2012). Clinicians may have to also be mindful of personal or others' perceptions and attitudes towards obese individuals (Puhl, & Heuer, 2009). Given these issues which uniquely relate to obesity, it may therefore be beneficial to consider it within research as a distinct behaviour change topic.

Chapter 2: Approaches to combating obesity and mechanisms of behaviour change

(thesis sub-section)

2.1 Health promotion policy

A particularly visible approach to combating obesity and other health-related behaviours is seen within initiatives developed by governing bodies. Increasingly, governments around the globe are endorsing health promotion initiatives, reflecting the role and responsibility they have taken in shaping national strategies to combat lifestyle-related illness and control rises in obesity (Gortmaker et al., 2011). Governments have published healthcare goals encouraging doctors to counsel patients more frequently about healthy behaviour change and increased emphasis on preventive care topics including smoking, diet, and alcohol consumption (Harris et al., 2001; U.S. Department of Health & Human Services, 2000). Calls for more policy in this area also demonstrate increasing acknowledgment that future healthcare services will be unable to cope with rises in lifestyle-related illness unless prevention services are adequately funded and developed (Tsou, Mackie, & Sim, 2006).

However, health promotion policies have targeted various areas of society, and demonstrate the substantial efforts by governing bodies to introduce societal level initiatives tackling lifestyle-related illness. The most relevant UK policy guideline examples are discussed within the following section and can be seen in Table 1. The UK's Cabinet Office's Behavioural Insights Team suggests using environmental initiatives such as reordering food displays in supermarkets to promote healthier food selection, and encouraging more active environments through fun-focused activities like the well-known 'piano stairs' example (Cabinet Office Behavioural Insights Team, 2010). The National Institute for Clinical Excellence (NICE) has published various recommendations involving pharmacological and behavioural healthcare guidelines for smoking cessation (NICE, 2007), reduced alcohol consumption (NICE, 2010), and improved levels of physical activity and healthy eating (NICE, 2006). The Department of Health launched the public

health campaign Change4Life (<http://www.nhs.uk/change4life>) which encourages a holistic approach to facilitate healthier lifestyle through collaborations among healthcare, school education, media and business rather than relying on prescriptive government guidelines alone (Department of Health, 2010a). This widespread recognition by policy makers also leads to raised awareness about these issues within wider society, for example, through promoting topical discussion within the media. There have been recent media reports about the NHS Future Forum recommending that health professionals routinely discuss lifestyle behaviours with patients (Campbell, 2011). Furthermore, the increased emphasis on obesity is demonstrated by the notable rise in national newspaper headlines including the word *obesity* from 30 headlines in 2001 to 400 in 2004 (Adshead & Thorpe, 2006).

However, the extent to which this awareness corresponds with evidence-based policy is sometimes contested. Some guidance explicitly acknowledges behaviour change theory and evidence. For example the Choosing Health white paper (Department of Health, 2004) outlines evidence-based behaviour change approaches such as goal setting, building confidence and capitalising upon cues and triggers. The subsequent NICE obesity guidelines (NICE, 2006), and NHS Health Trainers' Handbook also explicitly draw upon a range of health psychology theories (Department of Health, 2008). Both these guidelines support those who are tackling behaviour change with individuals as part of a range of clinical and non-clinical healthcare roles. Yet other initiatives such as the popularised *nudging* approach (Department of Health, 2010; Thaler & Sunstein, 2008), which involves altering micro-environments to cue health-related behaviour, have been criticised as lacking underpinning evidence of efficacy, specifically in terms of cost-effectiveness or long-term effects (Marteau, Ogilvie, Roland, Suhrcke, & Kelly, 2011; O'Dowd, 2011). As these recommendations are widely accessible and influential in shaping national public health strategies, it is essential that they are informed by the best available evidence on effective strategies.

Table 1. Summary of UK health promotion policy guidelines and their approaches to promoting health-related behaviour change

Policy guideline	Policy maker	Context or vehicle for behaviour change	Examples of behaviour change strategies/targets
Applying behavioural insight to health	Cabinet Office Behavioural Insights Team	Environmental modification	Alter food displays in supermarkets; add fun activities to promote walking (e.g. piano stairs).
NICE guidance (various)	NICE	Various health professionals / behaviour change specialists	Provides guidance for professionals (including practitioners) on behaviour change (including obesity, smoking, & alcohol consumption).
Change4Life	Department of Health	Collaborations with businesses, schools, healthcare, media	National campaign (targeting eating, physical activity, smoking, & alcohol consumption).
NHS Future Forum	Department of Health	Healthcare professionals	Encourages routine discussions about health-related behaviours within clinical interactions.
'Choosing Health' White paper	Department of Health	Development of a health promoting NHS	Recommends using evidence-based behaviour change techniques (e.g. goal setting / behavioural cues).
Health trainer handbook	Department of Health	NHS Health trainers	Training lay members of communities to provide theory-based behaviour change counselling to community members.
'Healthy Lives Healthy People' White paper	Department of Health	Environmental modification	Encourages nudging people into changing unhealthy behaviour by altering micro-environments.

Note. This table does not provide a comprehensive account of key health promotion policies, rather, it aims to summarise and illustrate the different policy approaches made within the UK. Policy guidelines are displayed in the order presented in the text.

2.2 Predicting and explaining health behaviour

The policies outlined above focus on implementing initiatives within healthcare systems and wider society in order to improve individuals' health behaviours. However, these initiatives result from a number of stages of development. One of the key stages following identification of the problem is conducting research that develops evidence and theory-based interventions. Unlike policy implementation, behaviour change intervention research aims to further existing knowledge about effective methods to facilitate health-related behaviour change; and it tends to do this via theoretical analyses of the factors involved.

2.2.1 Overview of behaviour change theories within the context of obesity

The persistent increases in obesity despite widespread recognition of its consequences support the argument that obesity-related behaviours are influenced by multiple interlinking factors, and not simply by awareness or knowledge of obesity-related consequences. This view is supported by the biopsychosocial perspective of illness (Engel, 1977), which has dominated philosophies of medical practice since the mid-20th Century and is still an established approach within today's healthcare systems (Borrell-Carrió, Suchman, & Epstein, 2004). Central to its message is that numerous psychological and sociological factors subjectively influence health, and that it is reductionist to assume that health and illness are only affected by objectively verified, biomedical factors (Borrell-Carrió et al., 2004).

Aspects of the biopsychosocial model are reflected within investigations of factors underlying obesity. Obesity has been associated with biological factors such as genetics and metabolism (Hankey, Eley, Leslie, Hunter, & Lean, 2004); psychological factors including mood, self-efficacy, coping and problem solving skills (Baker & Brownell, 2000; Byrne, 2002); and environmental factors for example, the impact of the food industry, and placement of local food stores within neighbourhoods (Harris, Pomeranz, Lobstein, & Brownell, 2009; Leung et al., 2011) and socio-economic status (Withall, Jago, & Cross, 2009). Furthermore, links between these factors have also been investigated. For instance, associations have been found between increased work-related stress and impaired metabolic functioning (see Chandola, Brunner, & Marmot, 2006). Together this indicates the level of complexity involved in being able to fully account for the factors underlying obesity.

Theories provide a helpful framework with which to investigate these factors further. Theories are defined as "a set of interrelated concepts, definitions, and propositions that presents a systematic view of events or situations by specifying relations among variables in order to explain and predict events or situations" (Glanz, Lewis, & Rimer, 1997, p. 21). Numerous theories developed to

explain health behaviours and behaviour change have been useful in identifying these underlying drivers and have informed intervention approaches (DiClemente, Crosby, & Kegler, 2002; Michie et al., 2005; Noar & Zimmerman, 2005). Those most widely used include the Health Belief Model [HBM (Becker, 1974)], Theory of Reasoned Action [TRA (Ajzen & Fishbein, 1980)], Theory of Planned Behaviour [TPB (Ajzen, 1985)], Social Cognitive Theory [SCT (Bandura, 1986)] and the Transtheoretical Model [TTM (Prochaska & DiClemente, 1984)] (Noar & Zimmerman, 2005).

One other model which is widely-used and demonstrates the multi-dimensional nature of health behaviour change is the PRECEDE-PROCEED model (Green & Kreuter, 1991). This draws attention to the variety of different types of factors that should be considered when developing successful health-related behaviour change interventions. The model stresses that social influences, epidemiological factors, environmental factors, and predisposing, reinforcing and enabling factors for individuals should all be acknowledged and utilised within interventions to achieve behavioural change (Clarke, Frankish, & Green, 1997). It is also more closely linked to the policy implementation stage than other models because it was developed to inform health promotion programs and aid effective implementation (Green & Kreuter, 1991). It has since been applied to hundreds of studies aiming to improve health in a variety contexts; many of which are community-based (e.g. schools and workplace settings), but it has also been used to inform public health initiatives and many healthcare interventions run by primary and secondary care clinicians, nurses, and dentists (for full list of studies using the PRECEDE-PROCEED model see Green, 1999).

2.2.2 Motivational models

Other theories have however, focused upon explaining particular aspects of health behaviour for example, one's motivation to engage in or change their health behaviour. The SCT and TPB are motivational models which propose specific mechanisms underlying *behavioural intentions*.

Within this process of intention formulation, different psychological and social determinants are identified. The TPB suggests that the following constructs influence health intentions and

behaviour: attitudes (relating to beliefs and evaluations of behavioural outcomes), subjective norms (beliefs about others' attitudes and motivation to comply with others) and perceived (internal and external) behavioural control (Ogden, 2000). SCT emphasises the role of self-efficacy which is defined as "judgements of how well one can execute courses of action required to deal with prospective situations" (Bandura, 1982, p. 122). This is a well researched psychological construct which is also included within Protection Motivation Theory (Rogers, 1975), the TTM (Prochaska et al., 1994), and Health Action Process Approach (Schwarzer, 1992). Increased self-efficacy is associated with improvements in various health-related behaviours including reductions in smoking and alcohol consumption (Hyde, Hankins, Deale, & Marteau, 2008) and improved eating and exercise behaviours (Teixeira et al., 2009) and condom use (Hendriksen, Pettifor, Lee, Coates, & Rees, 2007).

In relation to obesity, there is also evidence that self-efficacy is associated with the adoption of weight loss behaviours (Linde, Rothman, Baldwin, & Jeffery, 2006; Teixeira et al., 2009). One study found that following a 24-week diet and exercise intervention, obese women's change in BMI was significantly accounted for by self-efficacy and the authors concluded that addressing psychological pathways such as this may be more important than behavioural treatment in reducing obesity in this population (Annesi & Gorjala, 2010). A review exploring psychological aspects of weight management found that lower self-efficacy is associated with increases in relapse in obesity (Byrne, 2002). Furthermore, a randomised controlled trial of weight loss mediators in middle-aged women (n=225) found that at 24-months, exercise self-efficacy predicted weight reductions ($R^2 = 0.10$, $p < 0.001$) (Teixeira et al., 2009). The reported associations between self-efficacy and weight loss have also led to the development of questionnaires such as the Weight-efficacy Life-Style Questionnaire (Clark, Abrams, Niaura, Eaton, & Rossi, 1991) and the Situation-based Dieting Self-Efficacy Scale (Stotland & Zuroff, 1991). Together this evidence suggests that high self-efficacy is associated with better weight management and subsequent weight reductions in obese individuals. Thus, interventions taking into account the role of self-

efficacy as a key behavioural determinant may be more likely to achieve desired changes in obesity-related behaviour.

2.2.3 Goal activation models

Although evidence suggests that motivational theories can predict behavioural intentions (and some obesity-related outcomes), a major criticism is that they have been less clear in identifying mechanisms that transfer intentions into behaviours (Sniehotta, 2009). To address this limitation of motivational theories, other theoretical approaches such as goal theory (Bagozzi, 1992) and implementation intentions [IMPs (Gollwitzer, 1993)] have been developed to focus specifically on how intentions transfer into actions. Goal theory emphasises the cognitive processes involved in goal pursuit including goal desires (attitudes, subjective norms, and goal efficacy), as well as *instrumental acts* like planning, monitoring, and *motivational processes* such as effort and psychological commitment (Armitage & Conner, 2000; Bagozzi, 1992). It therefore builds upon motivational theories such as TPB by identifying how constructs like intentions are translated into behaviours (Armitage & Conner, 2000).

Alternatively, IMPs acknowledge the role of wider contextual factors in goal-action transfer and imply that an intended goal-directed behaviour will only be executed when optimal environmental conditions are met and related cues are elicited (Gollwitzer, 1993). Specifically, IMPs are formed by thinking about when, where and how a behavioural plan will be carried out, thus identifying an opportunity to act and an appropriate response to that opportunity (Gollwitzer, 1993). For example, 'if I am offered a dessert in a restaurant, I will choose not to have it, I will have a coffee instead'. The effective use of an IMP approach to behaviour change is supported by a meta-analysis of 94 studies (>8000 participants), which obtained a medium-to-large effect size ($d = .65$) of IMPs on goal attainment for a wide variety of different behaviours, including eating less snack foods, taking up a low fat diet and increasing exercise levels (Gollwitzer, Sheeran, & Mark, 2006). In addition to furthering understanding from earlier motivational theories about

what causes individuals to engage in health-related behaviour; IMP research also provides a theoretical explanation for established behaviour change techniques (Sniehotta, 2009) such as action planning (Leventhal, Singer, & Jones, 1965) and SMART goal setting (Abraham & Michie, 2008).

A relatively novel approach to explaining goal activation is research exploring teachable moments which is said to have drawn upon the cues to action component within the HBM (Becker, 1974; Cohen, Clark, Lawson, Casucci, & Flocke, 2011). Teachable moments are known as opportunities within individuals' lives in which there is particular potential for behaviour change to occur; for example a life event may act as a 'cueing event' (Cohen et al., 2011). Research in this area suggests firstly that teachable moments occur naturally within clinical interactions (Cohen et al., 2011), secondly that doctors can be trained to capitalise on them (Flocke et al., 2012; Lawson & Flocke, 2009), and thirdly that they are associated with better sexual health, alcohol consumption and injury prevention (McBride, Emmons, & Lipkus, 2003). It may therefore be beneficial for training interventions to take these findings into account and incorporate opportunities for healthcare professionals to learn about how to identify and utilise teachable moments within clinical consultations.

2.2.4 Multi-stage models

Multi-stage models offer an additional perspective on how behaviour change interventions should be designed and usually emphasise both motivational and volitional stages of health-related behaviours (see Armitage & Conner, 2000). The TTM in particular suggests that individuals move through stages relating to how ready they are to change (pre-contemplation, contemplation, preparation, action, and maintenance), and emphasises that interventions should therefore target the different underlying processes at each stage (Noia & Prochaska, 2010). The TTM also suggests that along with stages of change, behaviours are determined by decisional balance (the

advantages and disadvantages of change), self-efficacy, and change strategies used by the individual or change agents, such as counsellors, to facilitate change (Noia & Prochaska, 2010).

The TTM has had a dominating influence within the health promotion field through informing the design of various behaviour change interventions (Bulley, Donaghy, Payne, & Mutrie, 2007; Noia & Prochaska, 2010) and in relation to obesity, it has been frequently applied to physical activity (Bulley, et al., 2007), healthy eating, and weight reduction (Greene et al., 1999; Henry, Reimer, Smith, & Riecks, 2006). One UK study directly related to obesity management, involved training primary care nurses to select interventions for 1,906 obese patients with related co-morbidities, based on their assessed readiness to change (Ross, Laws, Reckless, & Lean, 2008). The study reported that 31.9% of remaining participants at 24 months had lost $\geq 5\%$ of their initial weight and thus suggests value in applying the TTM to obesity interventions. However, by tailoring interventions according to patients' stage of change, those deemed ready to change (contemplative and action stages) were provided with the full weight loss intervention. The intervention comprised a detailed behaviour change plan, involving self-monitoring and goal setting strategies that were continuously reviewed and modified. In contrast, those regarded as not ready to change were informed of the benefits of weight loss and not included in the above intervention analysis. Whilst this approach can be argued to have adhered to the assumptions of the TTM, the positive results reported may be explained by excluding those least likely to change from the main intervention.

Furthermore, despite the TTM's popularity and previous acceptance that behavioural change "requires movement through discrete motivational stages over time" (Prochaska, Redding, Harlow, Rossi, & Velicer, 1994, p. 471), concerns have since emerged around the multi-stage model approach to explaining health-related behaviour. In particular, multi-stage models are said to be less clear than other models in describing the determinants of health-related behaviour because motivational factors and transitions between stages are not described (Armitage &

Conner, 2000). The validity of assessing individuals' stage of change has also been questioned and it remains unclear whether different behaviours can be categorised into stages in the same ways (Bulley et al., 2007). For example it is easier to identify thresholds for the action and maintenance stages of smoking cessation, compared to thresholds for physical activity and healthy eating (Bulley et al., 2007). Hence, although the TTM has contributed directly to obesity intervention research and has received some support, criticisms of this approach also exist and should be taken into account when interpreting and designing research of this kind.

2.2.5 The value and drawbacks of research on behaviour change theory

The range of perspectives adopted by these theories illustrates the complex array of determinants that make behaviour change notoriously difficult (Marteau & Lerman, 2001). Not only do they focus upon different processes of behaviour (for example, motivation versus goal activation); they also identify various underlying psychological, social and environmental constructs. Furthermore, although their predictive value is helpful in unravelling this complexity and improving understanding about what causes people to engage in healthy and unhealthy behaviours; theoretical frameworks also allow tested, targetable factors for intervention to be identified (Michie, Johnston, Francis, Hardemen, & Eccles, 2008).

According to these theories, behaviour change interventions will be most successful when they address specific, determinants of behaviour (Marteau & Lerman, 2001). In support of this, a systematic review examining factors associated with the uptake of healthcare screening programmes, found limited evidence for the effectiveness of interventions using non-specific (atheoretical) educational materials that included printed and audio-visual materials, education based sessions (individuals and groups) and risk factor questionnaires (Jepson et al., 2000). Meta-analytic findings also show that using theory-based determinants of health behaviours within interventions is a strong predictor of effectiveness (Kok, van den Borne, & Mullen, 1997). Despite this, systematic reviews show that theoretical frameworks are underused within behaviour

change research (Hardeman, Griffin, Johnston, Kinmonth, & Wareham, 2000; Jepson et al., 2000). This research area has also been criticised for failing to clearly report applications of theories (Michie & Prestwich, 2010). Hence, healthcare governing bodies such as the WHO and the Medical Research Council (MRC) now encourage all interventions for health-related behaviour to be based upon relevant theories (Michie et al., 2008; WHO, 2002).

One proposed reason for the poor application of theory to inform interventions is the complexity involved in selecting suitable theories. Specifically, overlapping components within models have led to difficulty in selecting appropriate theories for interventions because multiple models are often able to explain targeted behaviours (Francis et al., 2009). For example, it is possible to identify a variety of motivation-based intervention components that are consistent with all of the following theories: TTM, TRA, SCT, and HBM (Britt, Hudson, & Blampied, 2004). Although this argument applies to health-related behaviour change in general, it is also likely to relate to some of the shortcomings of obesity intervention research because it is one example of a health behaviour outcome which is often targeted by behaviour change interventions. In order to overcome this issue, a more inclusive approach to theory selection has been proposed in which a multiple theoretical domains interview can be used to select theoretical components which are most appropriate to a given intervention, thereby selecting components from multiple behaviour change theories and tailoring the intervention to a particular context based upon which behavioural determinants most strongly predict the target behaviour (see Michie et al., 2005). This work highlights the limitations of using single models of behaviour change within research compared to selecting salient behavioural determinants from various models. For example, there is often overlap between other existing models which limits confidence in selecting the most appropriate theory. This may in turn account for the numerous atheoretical behaviour change interventions cited within literature (Michie et al., 2005). Also, single theories (although more parsimonious) may restrict researchers in investigating other salient concepts relating to a target behaviour within an intervention and therefore draw incomplete conclusions regarding

active/inactive intervention ingredients. The risk of omitting relevant intervention components by drawing upon single psychological models of behaviour change can also be illustrated when comparing them with models from other areas of the literature for example, from environmental and public health initiatives (see section 2.1 above). In contrast to psychological models which often include reasoned determinants at the individual level (e.g. individuals' attitudes or beliefs towards the behaviour), various other initiatives (See Table 1) focus upon different aspects of behaviour change such as restructuring micro-environments and encouraging automatic or impulsive behaviours (e.g. via altering supermarket food displays). This highlights the importance of being inclusive when designing behaviour change interventions and considering a range of potentially salient constructs that may relate to differing contexts and settings. Research has therefore emphasised both the importance of including theoretical frameworks within interventions and ensuring that the most appropriate models are selected.

2.3 Behaviour change techniques

When drawing on the evidence reviewed above regarding the use of behaviour change theory to inform interventions, it is important to consider how theoretical determinants can be translated to specific behaviour change techniques for use within interventions. Behaviour change techniques can be defined as "observable and replicable components of behaviour change interventions...the smallest component compatible with retaining the postulated active ingredients, that is, the proposed mechanisms of change" (Michie & Johnston, 2012, p. 3). This reflects a logical process of intervention design which aims to improve health by facilitating behaviour change through identifiable techniques which are based on behavioural determinants, drawn from theories (an illustration of this is displayed in Figure 1).

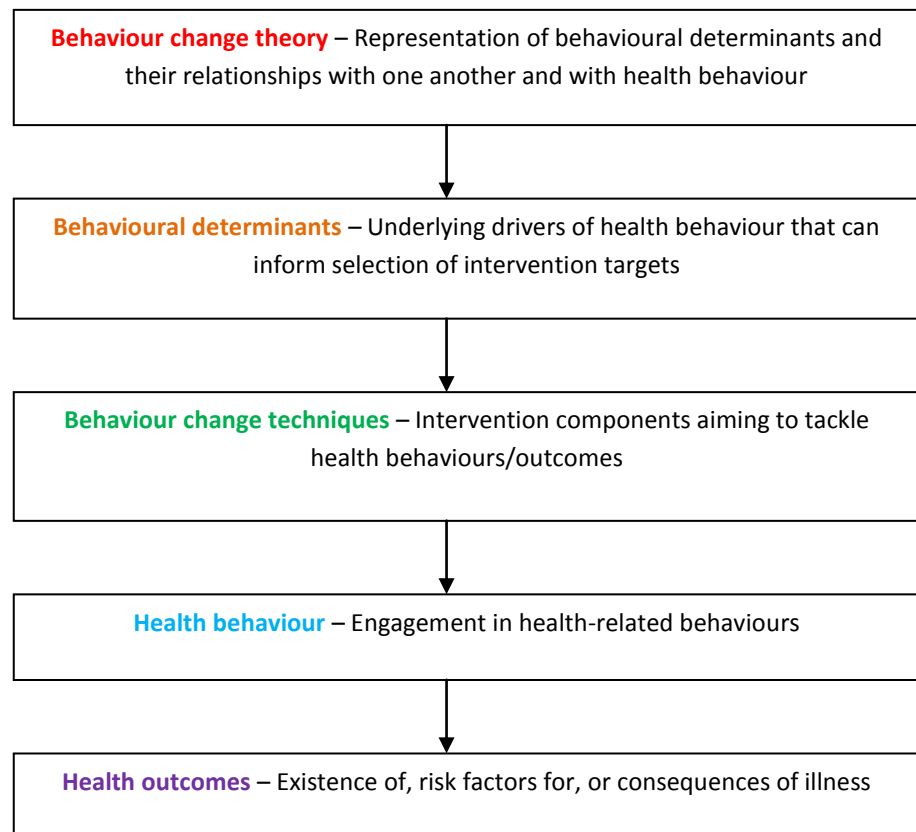


Figure 1. **Process of the potential influence of behaviour change theory upon health/illness via intervention design (developed by AC)**

It is well documented that many different behaviour change techniques are used within interventions but that in the past, studies have defined these differently and unclearly, which has subsequently limited replication and evaluation of interventions (Dombrowski, 2009; Michie & Abraham, 2004; Stavri, Beard, West, & Michie, 2009). Without clear definitions of behaviour change techniques it is impossible to determine what constitutes the effective or active ingredients within behaviour change interventions, and this may account for the slow application of behaviour change research (Dombrowski, 2009). Due to this and the fact that behaviour change techniques available for use are so numerous (and map onto various overlapping theories), recent attention has been turned towards summarising the available evidence on behaviour change techniques (Abraham & Michie, 2008).

Specifically, there is continuing development of a behaviour change taxonomy which is informed by motivation, action and organisation theories (Michie et al., 2005), and includes associated behaviour change techniques such as role play, feedback, use of imagery, stress management and goal setting (Michie et al., 2011; Michie et al., 2008). The latest available version of this is the CALO-RE taxonomy which has been developed within the context of supporting individuals to change their eating and activity patterns (Michie et al., 2011). The extent to which this taxonomy is generalisable to other behavioural domains has not yet been tested. In addition to this ongoing work, a comprehensive list of behaviour change competencies (Health Behaviour Change Competency [HBCC] framework) has also been developed for healthcare professionals who are required to manage health-related behaviour change with patients (Dixon & Johnston, 2010). The HBCC identifies 89 techniques that reflect relevant behaviour change literature and are categorised into three key concepts; Motivation development, Action on motivation, and Prompted or cued behaviour (representing a MAP of behaviour change). Thus despite its complex nature, there is now a developing evidence base that can inform obesity-related behaviour change interventions.

These developments are helpful in terms of improving the transparency of intervention content and descriptions of the theoretical frameworks used within them. However, researchers have now also begun to use behaviour change taxonomies to determine which techniques are most effective for changing different behaviours (e.g. Michie, Jochelson, Markham, & Bridle, 2009). Regarding obesity management, reviews have identified that diet and physical activity were more likely to improve if interventions included self-monitoring within them (Michie, Abraham, Whittington, McAteer, & Gupta, 2009) and that techniques relating to control theory (Carver & Scheier, 1982) may be particularly effective for obese adults with co-morbidities (Dombrowski et al., 2012). Furthermore, as the relationship between obesity and self-efficacy has been identified within the literature (Annesi & Gorjala, 2010; Byrne, 2002; Linde et al., 2006; Teixeira et al., 2009), it may be that techniques focusing upon self-efficacy are also effective in facilitating obesity-

related behaviour change. It has proven challenging however to identify behaviour change techniques that may influence self-efficacy (Linde et al., 2006). In its earlier conceptualisation, Bandura (1977) suggested that enactive mastery experience, vicarious experience, verbal persuasion, and affective states all underlie self-efficacy and therefore have the potential to increase it. In line with this, a recent systematic review has identified that feedback on performance (verbal and non-verbal) and vicarious experience were strategies associated with higher self-efficacy (Ashford, Edmunds, & French, 2010).

These examples indicate some specific behaviour change techniques that may support obesity management. However, investigations of the extent to which theory has or has not been used to underpin obesity management interventions as a whole have highlighted that most traditional interventions primarily aimed to increase patient knowledge (Katz & Faridi, 2007). Instead of being guided by causal pathways within theories, this approach assumes that a lack of knowledge underlies obesity-related behaviour and results in interventions focused upon health outcomes rather than weight loss strategies based upon individuals' barriers and facilitators for behaviour change (Katz & Faridi, 2007).

Drawing from research on a wider range of health behaviours, it has also been established that information-giving, persuasion and fear tactics have limited value in facilitating behaviour change (Bellamy, 2004; Bien, Miller, & Tonigan, 1993; Britt et al., 2004; Kottke, Battista, Degriese, & Brekke, 1988) and are suggested to reduce individuals' motivation to change because they are generic and do not take into account the importance of tailoring interventions to individuals (Marteau & Lerman, 2001; Ogilvie, Egan, Hamilton, & Petticrew, 2004). This also reflects principles of SCT that tailored behaviour change interventions recognise the influence of individuals' environments and cognitive representations of their social world upon health-related behaviours (Bandura, 1986). Finally, evidence also suggests that using incentives to facilitate behaviour

change is ineffective (Cahill & Perera, 2008; Jepson et al., 2000). A meta-analysis also found that financial incentives had no significant effect on participant weight loss at either 12 months ($Z=1.07$, $p=0.28$) or 18 months ($Z=0.81$, $p=0.42$) post-intervention (Paul-Ebhohimhen & Avenell, 2008).

As suggested above, one explanation for these findings is that these strategies do not map onto behavioural determinants. This is supported by research showing that intervention efficacy is related to the inclusion of underlying theory and not other factors such as the number of behaviour change techniques included within interventions (Dombrowski et al., 2012; Michie & Johnston, 2012; Taylor, Conner, & Lawton, 2012). Together, these examples show that there is a growing body of evidence to guide the selection of behaviour change techniques to inform interventions both in terms of what may be effective in facilitating obesity-related behaviour change and what is more likely to be ineffective. This literature also highlights that some behaviour change initiatives and interventions have not been informed by the available evidence and that further work is needed in order to clarify the most effective techniques for facilitating obesity management.

Chapter 3: Obesity management by healthcare professionals (thesis sub-section)

Many obesity intervention studies have focused upon the individual as the primary agent for change, emphasising their role in changing their own behaviour (Anderson, Konz, Frederich, & Wood, 2001; Annesi & Gorjala, 2010; Hardeman et al., 2000). However, healthcare professionals frequently manage patients that would benefit from weight loss (Lenzer, 2010), and thus behaviour change research also often involves healthcare professionals who deliver the proposed interventions (Kinmonth et al., 2008; Madden, Loeb, & Smith, 2008). In line with the arguments discussed in Chapter 2, obesity counselling by medical practitioners is also viewed as most effective when it is theory-based, yet the necessary translation of behaviour change theory to application within routine medical practice has not yet been achieved (Chisholm, Hart, & Peters, 2011; Katz & Faridi, 2007). Integrating theory-based interventions into medical settings is said to be particularly problematic due to the complex nature of the applied theories which do not account for the practical limitations of medical practice (Katz & Faridi, 2007). However, other evidence suggests that the level of implementation for atheoretical obesity interventions in medical practice is also low (Moore et al., 2003).

Together this suggests that although the inclusion of theory should benefit obesity management interventions in healthcare settings, there are barriers to implementation within practice. To investigate the challenges to this research-to-practice implementation, the following chapter will explore key factors highlighted by the literature: 1) the obesity management roles expected of and carried out by health professionals, 2) preparation for this role during medical education, 3) how educational theory may help to support the design and implementation of obesity management education.

3.1 Whose role is it anyway?

As the focus of healthcare is constantly evolving with societal and environmental developments, shifts in disease patterns towards lifestyle-related illness have changed what is expected from healthcare professionals (Jones, Higgs, Angelis, & Prideaux, 2001). Guidelines from healthcare organisations emphasise that obesity management which includes engaging in tailored behaviour change communication with patients, is a fundamental role for various healthcare professionals including counsellors, psychologists, dieticians, nurses and doctors (Department of Health, 2008; NICE, 2006; WHO, 2008a). However, this guidance is less clear in identifying specific responsibilities for different professionals, which is likely due to the multidisciplinary nature of modern healthcare systems and the complex relationships between obesity and other illnesses. Hence, past obesity interventions have been carried out by dieticians (Wylie-Rosett & Delahanty, 2002), health trainers (lay members of local communities) (Department of Health, 2008), primary care nurses (Gance-Cleveland, Sidora-Arcoleo, Keesing, Gottesman, & Brady, 2009) and doctors (Jay et al., 2010) alone and collaboratively (Counterweight Project Team, 2005). Interventions by healthcare professionals have also been carried out with patients suffering from obesity-related conditions including hyperlipidemia, hypertension, and diabetes (Ma, Urizar, Alehegn, & Stafford, 2004), and in various medical settings including pediatrics (Perrin, Flower, Garrett, & Ammerman, 2005; Small, Anderson, Sidora-Arcoleo, & Gance-Cleveland, 2009), internal medicine, gynecology, endocrinology, cardiology, and orthopedics (Kristeller & Hoerr, 1997).

It is therefore not clear in which settings and by whom, obesity should be managed. However, it is often said that primary care practitioners are in an ideal position to facilitate health-related behaviour change due to the consistent relationships that can be formed between patients and practitioners in this setting (Laws et al., 2009; NICE, 2006; Walsh, Swangard, Davis, & McPhee, 1999). Furthermore, the National Audit Office (2001) has recommended that in order to tackle obesity, GPs should discuss health promotion with patients and provide them with weight loss advice. Maeshiro et al. (2010) recently highlighted that over a century ago Abraham Flexner

advocated that doctors' have a societal obligation to prevent disease and promote health (Flexner, 1910). In line with this, the General Medical Council (GMC) have explicitly recommended that medical students graduate competent to "discuss psychological aspects of behavioural change" with patients and "communicate appropriately...when discussing sensitive issues, such as alcohol consumption, smoking or *obesity [author's emphasis]*" (GMC, 2009, p. 15 & 22 respectively). Traditional and modern perspectives seem therefore to agree that medical professionals have an important role in facilitating health-related behaviour change with their patients. Furthermore, although there is little evidence from the patients' perspective, some qualitative studies have identified that parents of children with obesity want and expect doctors to discuss obesity management with them and to take a more active role in encouraging changes in children's diets and physical activity patterns (O'Keefe & Coat, 2009; Pagnini, Wilkenfeld, King, Booth, & Booth, 2007).

However, contrasting evidence exists in studies exploring doctors' views of their own role in obesity management. A qualitative interview study with UK GPs (n=21) found that participants believed obesity to be the responsibility of the patient and not a medical problem to be addressed by the GP (Epstein & Ogden, 2005). Intervention research has also cited problems with implementation due to doctors' views about their role. One study trained GPs in motivational interviewing and elicited improvements in skills, attitudes, and confidence but despite this found that GPs expressed reluctance to implement learned skills because they felt motivating behavioural change was not their responsibility and that practice nurses were better suited to this job (Broers et al., 2005). Additionally, a Swiss intervention aiming to increase physical activity counselling within primary care reported difficulties with implementation due to clinician concerns over expanding their role to incorporate preventive medicine (Schmida, Egli, Briana, & Bauera, 2009). These findings therefore imply that regardless of the quality of an intervention, problems with implementation may persist due to attitudes and perceptions about how relevant it is to those expected to deliver it.

Furthermore, recent evidence from qualitative interviews with both primary and secondary care doctors suggests that this lack of clarity over roles and responsibilities can act as a barrier to engaging in behaviour change talk with patients (Chisholm, Hart, Lam, et al., 2012). Despite all participants reporting that health-related behaviour change formed an important part of their work and contributed significantly to their patients' health; secondary care doctors felt that GPs were responsible for facilitating behaviour change, whereas GPs disagreed and felt it was the job of other more specialist professionals such as nurses or dieticians. Instead of facilitating change, participants felt more responsibility to raise awareness about the need for change, and to refer to more appropriate resources. This contrasts however with clinical guidelines recommending that all doctors manage obesity with patients through tailored plans and exploring their barriers to lifestyle change (NICE, 2006).

The confusion over doctors' roles is reflected in research which suggests medical professionals rarely engage in discussions about obesity management with patients (Galuska, Will, Serdula, & Ford, 1999; Scott et al., 2004). This occurs despite frequent opportunities for obesity management to be discussed and despite evidence that doctors can be successful in facilitating moderate weight loss with patients (see Scott et al., 2004). For example, a recent national survey of American Academy of Pediatrics (AAP) members (n=667), found that BMI was not assessed in 48% of children over two years old due to perceived lack of time and effectiveness related to weight counselling (Klein et al., 2010). In another survey study, diet and physical activity counselling rates by doctors in US ambulatory settings were shown to be as low as <45% and ≤30% respectively, for 'at-risk' adults suffering from different lifestyle-related illnesses including hypertension, diabetes, hyperlipidemia and obesity (Ma et al., 2004). Much of this literature derives from the US, although in a UK audit of health advice to hospitalised patients, it was found that although all nine hospitals included in the study delivered adequate levels of advice on diet, none met standards for smoking or obesity advice (Haynes & Cook, 2009). Together, these findings suggest that the views of healthcare organisations, healthcare researchers (who continue

to provide training to medical professionals) and also perhaps of patients, differ from those of working medical professionals, and that this may prevent successful obesity management from being carried out in practice.

In addition to these discrepancies over doctors' roles, it has been suggested that discussing obesity with patients may be a particularly challenging topic compared to other health-related behaviours. For example, qualitative research suggests that doctors view obesity as an uncomfortable and sensitive subject that can be hurtful or embarrassing for patients, and sometimes awkward for doctors as well (Chisholm, Hart, Lam, et al., 2012). Doctors' lack of confidence and skills in this area have frequently been cited as a barrier to successful behaviour change facilitation within medical practice (Bruce & Burnett, 1991; Chisholm, Hart, Lam, et al., 2012; Huang et al., 2004; Jelalian, Boergers, Alday, & Frank, 2003; Perrin et al., 2005; van Gerwin, Franc, Rosman, Le Vallant, & Pelletier-Fleury, 2009). Given these findings, and the evidence previously discussed on the prevalence of weight stigma within current society and healthcare settings (Foster et al., 2003; Jay et al., 2009; Puhl & Heuer, 2009; Sabin et al., 2012), it is unsurprising that doctors also feel that obesity management discussions can threaten the doctor-patient relationship due to their sensitive nature and potential for upsetting the patient (Chisholm, Hart, Lam, et al., 2012; Epstein & Ogden, 2005).

Hence, obesity is regarded as a particularly difficult subject to discuss in medical practice and because it is a socially sensitive topic, doctors may feel unable to appropriately and effectively engage in the necessary behaviour change discussions with patients. These findings, commonly derived from survey and qualitative studies, indicate that doctors feel ill-equipped to discuss obesity management with patients. This research however, does not describe how medical education has attempted to prepare doctors for this task. One advantage to focusing on obesity management education at the undergraduate level is that once qualified, doctors are more likely to attend training they are already enthusiastic about (Salmon et al., 2007). Thus doctors may not

engage in training about topics they are less familiar, confident or comfortable with. As obesity is a difficult topic to discuss (GMC, 2009), and one that many doctors feel unconfident and uncomfortable with (Chisholm, Hart, Lam, et al., 2012), it may therefore be more productive to provide compulsory obesity management education for students during medical school, rather than offer it to them once qualified.

3.2 Current obesity management education within medical schools

It is suggested that for doctors to successfully facilitate behaviour change in relation to any health-related behaviour (and perhaps obesity-related behaviours in particular, see above); they must have gained effective communication skills and have learned specific behaviour change techniques within undergraduate medical education (Moser & Stagnaro-Green, 2009). The task of equipping medical students with good clinical communication skills has undergone a significant shift in emphasis over the last 20 years in that it is now well recognised as a 'need to know' rather than a 'nice to know' topic (Brown, 2008). Clinical communication is now a core part of UK undergraduate medical education and is associated with improved patient satisfaction with doctor-patient interactions, and students having a better understanding the needs of their patients (Aspegren & Lonberg-Madsen, 2005; Williams, Weinman & Dale, 1998). Communication skills education may be of particular importance however, to facilitating behaviour change with patients because communication is recognised to be the central vehicle in enabling doctors to explain risk, give information, and negotiate management plans with patients (Brown, 2008). Although communication clearly facilitates more than this (e.g. building rapport with patients, sharing accurate information with colleagues), the three tasks described above are all essential components of addressing behavioural change with patients. Furthermore, healthcare professionals report finding obesity particularly difficult to discuss and express concerns about raising the subject within consultation as well as worrying that it may provoke emotional reactions from patients (Michie, 2007). Communication skills are therefore fundamental to raising obesity management discussions and also facilitating associated behaviour change with patients.

However, despite undergraduate medical education now including communication skills as a core element, evidence suggests it is often still viewed as a marginal subject (Silverman, 2009). One reason for this may be that students are given conflicting messages about the importance of communication skills in medical practice from senior medical professionals that interact with them throughout medical school (Hambly, Robling, Crowne, Hood, & Gregory, 2009; Silverman, 2009). Studies also show that medical educators associate obese patients with weakness and moral failing (Phillips & Clarke, 2012), and that these patients can be marginalised by doctors, being seen to have caused their own health problems (Wear, Aultman, Varley, & Zarconi, 2006).

These negative attitudes by senior doctors and medical educators may subsequently influence students' personal beliefs and perceived future selves as doctors (Phillips & Clarke, 2012) and reduce student professionalism and empathy (Wear et al., 2006). Thus it may be that medical education and perhaps influences of the hidden curriculum in particular (Hafferty, 1998), are damaging some aspects of effective communication with patients about obesity management. It may therefore be beneficial when role models for students display more sensitive and professional attitudes towards obese patients in general.

It has also been highlighted that communication skills are not assessed rigorously within medical schools and are thus often presented as additional rather than a core set of skills important in all clinical tasks (Silverman, 2009). Similarly, behavioural and social science (B&SS) teaching, which includes health-related behaviour change topics including obesity, has also been described as a low priority topic in medical education, despite research which has emphasised the importance of understanding medical practice within cultural and societal contexts (see Litva & Peters, 2008) and furthermore, despite GMC recommendations that B&SS is a core component of the undergraduate medical curriculum (GMC, 2003). Early reviews of how well UK medical schools implemented *Tomorrow's Doctors* (1993) showed that public health was one of the only topics

which most medical schools had failed to take up (Christopher, Harte, & George, 2002). Apart from this overview, it remains unclear to what extent these subjects are taught within medical schools (Litva & Peters, 2008). Furthermore, rapid population changes in lifestyle-related illness incidence have caused difficulties in delivering up-to-date B&SS education (Greenfield et al., 2001). Other common problems include difficulties in finding available and qualified staff, a lack of space in the medical curriculum, conflict with the more traditional 'biological mindset' within medical education, and perceptions that B&SS is not relevant to medical training (Litva & Peters, 2008). It is unsurprising therefore that health-related behaviour change has been viewed as an 'optional extra' which is often either invisible or included discretely within patient information topics in the UK medical curricula (Naidoo & Orme, 2000).

In light of the above research illustrating the barriers to communication skills and B&SS education, it may follow that similar challenges are encountered when integrating health-related behaviour change education into the medical school curriculum. This is especially likely as these topics are linked; effective communication is core to facilitating behaviour change with patients, and the topic of 'behaviour change' falls within broader B&SS subjects such as health promotion and preventive medicine. These topics, including lifestyle counselling, health promotion, preventive care, and behaviour change skills teaching have all been investigated in relation to their presence within medical education (Dovey, Green, & Fryer, 2000; Naidoo & Orme, 2000; Sargeant, Valli, Ferrier, & Macleod, 2008; White, Gazewood, & Mounsey, 2007). Within this area of literature it is acknowledged that despite GMC encouragement since 1993, health promotion and preventative care in particular are not well established within UK medical programmes (Wylie & Thomson, 2007). Similarly, there are calls for more substantial education about population health within US medical education (Maeshiro, 2008).

Regarding behaviour change education specifically, research findings show that few US medical schools offer behaviour change counselling education, and those that do tend to provide

unstructured and inconsistent courses (Bell & Cole, 2008). It has also proven difficult to find suitable teachers as health promotion is often perceived to be an interesting but a non-essential subject (Wylie & Thomson, 2007). Taken together, this illustrates how health-related behaviour change education currently features within medical education and suggests some of the difficulties involved. However, this research frequently describes health-related behaviour change education and related subjects (preventive medicine/health promotion) in a general manner without distinguishing between different types of behaviours. It is therefore unclear how obesity education as a distinct subject might feature within medical education and to what extent future doctors are prepared to manage this condition with patients in medical practice.

In relation to obesity education specifically, research has suggested that medical students' knowledge and satisfaction with this topic is significantly lower than dietician students' even though both groups agreed obesity management was an important aspect of their clinical roles (Swift, Sheard, & Rutherford, 2007). Doctors have also associated being unprepared and unskilled to manage obesity with not being prepared by medical school, and in one study 60% of participants believed they had been provided with insufficient knowledge of nutrition to discuss unhealthy eating patterns with patients (Fogelman et al., 2002). Although unsubstantiated by empirical evidence, medical education researchers assert that there is a lack of obesity education in medical schools, that medical educators are slow to prioritise obesity and that there is a lack of obesity content in medical examinations (Treyzon, 2005).

Despite this, recent research within US medical schools suggests a shift in attitudes towards weight counselling with patients. Between 54% and 70% of students in one study identified weight counselling as highly relevant to their medical careers, although fewer (25%) reported regularly providing this to patients (Rose, Frank, & Carrera, 2011). Specific education in obesity may also meet the reported needs of qualified doctors who encounter challenges when attempting to change obesity-related behaviours with their patients (Chisholm, Hart, Lam, et al.,

2012; Hansson, Rasmussen, & Ahlstrom, 2011). Thus there is paucity of evidence regarding the extent and quality of obesity management education provided to medical students despite indications that doctors and medical students require it and would value it.

As obesity is a condition that is relevant to many areas of medicine and affects almost all body systems (Katz & Faridi, 2007), it is likely that curriculum integration will be difficult in terms of how, where and by whom such education should be delivered. These issues however, highlight the need for research in this area, and there is some emerging evidence that at least within research settings, behaviour change strategies such as motivational interviewing can be taught successfully to medical students (Childers et al., 2012). If obesity education should and can be delivered to medical students, it would be beneficial to design educational interventions in this area and consider how to optimise the potential efficacy of these interventions.

3.3 Applications of education theory to obesity management education

The arguments above suggest that obesity management should exist within medical education, and that there are salient but targetable barriers to its inclusion. Given that this provides a rationale for the development of medical education in this area, it is important to consider how to optimise teaching and learning environments for medical students so that *effective* medical education is produced. Thus it may be helpful to consider the utility of education theories which aim to explain and subsequently enhance student learning. As with theories of health behaviour, there are numerous education theories which illustrate determinants and proposed casual pathways of learning. One type of education theory that has been given substantial attention and stimulated great interest within the literature, is adult learning styles (Coffield, Moseley, Hall, & Ecclestone, 2004). Particular consideration will be given to this theory due to the wide-spread recognition about its potential influence upon learning. This section will then go on to describe a number of theories which have been applied more explicitly to medical education.

In a large systematic review of adult learning styles, 71 models of learning were identified and 13 categorised as leading models in the field (Coffield et al., 2004). Within these models, various determinants of learning were identified. One example is Dunn and Dunn's learning styles model (Dunn & Griggs, 2003) which identified the following factors as influential in adult learning: environmental factors (e.g. sound / light / temperature of room), emotional factors (e.g. motivation / persistence), sociological factors (e.g. working in groups, support from authoritative figures). Alternatively, Apter's (2001) Motivational Style Profile emphasises the influence of personality upon learning. It suggests that motivation-learning pathways are based on individuals' characteristics such as the extent to which one seeks achievement verses fun, or wanting to conform verses having freedom (Apter, 2001). Although various determinants of learning have been identified within these pedagogic models, there is a paucity of evidence regarding their impact on student learning, and a lack of robust evaluations in which reliable instruments are used to test their validity and reliability (for full critical review of learning style models see, Coffield et al., 2004). Thus, until a more consistent evidence-base is established, educators should proceed tentatively when using such theories to shape medical education.

Moving from the work on individuals' learning styles, towards theories which have been more frequently applied to the context of *medical* education, there are a number of frameworks which have been described. Adult learning theory (Knowles, 1980) which encompasses a number of individual theories focusing upon different learning processes, has been widely applied to understanding and explaining medical education (Kaufman & Mann, 2010; Maudsley & Strivens, 2000). Its key features suggest that adults are self-directed learners (determining personal learning needs and means to meet them), use past experiences to facilitate learning new concepts/skills, are problem-centred not subject-centred, and are motivated more by internal than external factors, thus personal reasons to succeed surpass external incentives/rewards (Kaufman & Mann, 2010). Although this theory has been widely acknowledged within the literature (Maudsley & Strivens, 2000), it is also important to note that critiques have questioned

the extent to which these components are upheld for all adult learners across different contexts (for example see Mann, 2004). Alternatively, SCT (Bandura, 1986) has also been widely used to explain learning in medical education and acknowledges social or interactive aspects of learning in particular. It suggests that personal, environmental and behavioural factors all interact together to mediate learning and that in the context of medical education, these would relate to the medical student (e.g. their attitudes / knowledge), the learning environment (e.g. clinical verses a university setting) and learning activities (e.g. role play and peer feedback) respectively (Kaufman & Mann, 2010).

Researchers have also suggested various ways to facilitate learning along these theoretical pathways. For example self-directed learning may be facilitated through allowing students to ask questions, identify their own gaps in knowledge and skills, and critically appraise their own learning process and outcomes (Kaufman, 2003). Also important is cultivating a sense of self-efficacy (a basic tenet of SCT) which may be enhanced through experiencing or witnessing success, verbal persuasion (especially from a figure of authority), and through cultivating optimal physiological states (e.g. by interpreting sensations in difficult situations as excitement rather than vulnerability) (Kaufman, 2003). Consistent with a constructivist approach to education which suggests that understanding is actively constructed by the learner using their perceptions and knowledge (Mann, Dornan, & Teunissen, 2011), medical educators should actively engage students in learning and emphasise how students' previous knowledge fits in with new learning experiences they encounter (Kaufman, 2003).

Finally, reflective learning is recognised as a core competence required of medical professionals (Epstein & Hundert, 2002) as well as something that practicing medical professionals often do in practice (Mann, Gordon, & MacLeod, 2009). Subsequently reflection is also encouraged within medical education. Schön's (1987) theory of reflection suggests that individuals should reflect both 'in' and 'on' practice to optimise learning. In other words, it is recommended that immediate

and delayed reflection on learning should occur and this could be achieved through using tools such as journals, peer feedback and debriefing (Kaufman, 2003). It is important to note however, that these suggestions are informed primarily by theories of learning rather than from direct evidence in support of their impact upon medical student learning.

Emerging evidence has however begun to demonstrate the impact these theories have upon medical trainees and professional learning. For example, when considering reflective learning it has been shown that when medical trainees engage in reflective practice, diagnostic errors are reduced for complex but not simple clinical cases ($F[1,41] = 4.48, p < 0.05$) (Mamede, Schmidt, & Penaforte, 2008) and qualitative research suggests that reflection may be integral to medical professionals' ability to process and use feedback (Sargeant, Mann, Vleuten, & Metsemakers, 2009). It has also been highlighted that learning is maximised when medical education is in context and relevant to students as this enhances recall and motivation (Bundy et al., 2010). Early work supports this, illustrating that information is processed more deeply by students when educational content is relevant to them and also when assessments are perceived to require in-depth understanding (Newble & Entwistle, 1986).

There is also evidence that learning within various medical education contexts is enhanced when personal goals are set, when learners exhibit curiosity, and more specifically that learning is sped up and made more accurate when feedback on performance is provided (Mann, 1994, 2004). Evidence also supports motivational theories of education. A literature review exploring the impact of motivation theories demonstrated that motivation is a key determinant of learning that is also associated with improved academic performance (Kusurkar, Croiset, Mann, Custers, & Cate, 2012). Despite this, most major changes to medical programmes target cognitive rather than motivational processes of learning, which again demonstrates that theory has not been used to its full potential in intervention settings. Finally in relation to the delivery of medical education, a Cochrane review has indicated that health professional learning may be maximised when

education is delivered using a mix of didactic and interactive methods rather than each of these alone (Forsetlund et al., 2009).

Although research has not directly used education theory to inform obesity management education for healthcare professionals, it is helpful that these theoretical frameworks and emerging evidence-bases exist, as they then have the potential to inform optimal teaching and learning in this area. Further work is needed however, in order to evaluate the application of these theories to medical education learning interventions and more specifically, to identify which determinants of learning are most important in developing effective medical education on obesity management.

Chapter 4: Overview of thesis aim and study designs (thesis sub-section)

4.1 Thesis aim and objectives

Based on the requirement that medical students are able to discuss obesity management and behaviour change with patients (GMC, 2009), the central aim of this thesis is to contribute to the current literature on what constitutes optimal education for medical students in this area. There are two key objectives within this aim.

Objective 1. To investigate previous and current obesity management education for medical students in order to identify effective and ineffective examples of this education, and more generally to identify the extent to which medical students are currently being successfully prepared for engaging in constructive obesity management discussions with patients. Successful preparation in this context relates to the extent to which obesity management education is based upon relevant theory- and evidence-bases; its impact upon student learning in line with robust evaluations of educational interventions; and the extent to which it is being successfully delivered to students and implemented within undergraduate medical programmes.

Objective 2. To draw from study findings associated with Objective 1 as well as the literature on theory-based behaviour change techniques, to design an appropriate obesity management education intervention for medical students. The proposed education should translate knowledge about behaviour change theory into usable clinical communication tools for medical students. It should also be effective in improving students' ability to engage in constructive obesity management discussions with patients; be feasible to deliver within an undergraduate medical programme; and acceptable to students. It is hoped that the development and preliminary evaluation of an educational intervention of this kind will provide an example of successful obesity management education that prepares medical students for practice.

The following five research questions derive from the above objectives:

- 1) How have previous educational interventions approached obesity management education for medical students and how effective are they in preparing medical students for practice? (Objective 1)
- 2) How do medical schools currently deliver obesity management education and what helps or hinders its implementation? (Objective 1)
- 3) Can theory-based behaviour change techniques be used to inform obesity management education for medical students? (Objective 2)
- 4) Can a theory-based educational intervention improve the likelihood that medical students' will engage in constructive obesity management discussions with future patients? (Objective 2)
- 5) Is the inclusion of theory-based behaviour change education for medical students feasible and acceptable within an existing undergraduate medical programme? (Objective 2)

4.2 Study designs and methods

A number of different study designs and methods were used to address the above research questions. Firstly, a systematic review of the literature was conducted to identify existing educational interventions in obesity management for medical students. Within this a standardised PICOS (population, intervention, comparators, outcomes, study design) framework was used to guide search and inclusion/exclusion criteria. A narrative analysis was conducted to summarise the key findings of this review. Systematic review methods were also used in an additional study to identify published descriptions of education in this area, but not necessarily empirically defined interventions. A coding scheme informed by standardised definitions of theory-based behaviour change techniques was modified to identify the presence of these techniques within articles identified by the review. Analysis involved identifying the frequency of techniques reported in

content descriptions of the education. A qualitative study was used to explore medical educators' perceptions of current obesity management education and data for this was collected using semi-structured telephone interviews. These interviews were transcribed verbatim and analysed using grounded theory principles to illustrate the key challenges educators and medical schools face when incorporating this education within existing undergraduate medical programmes.

In order to develop appropriate educational materials for medical students, and to facilitate the translation of behaviour change theory to communication tools for use with patients, a quantitative discriminant content validity study was then conducted. This study involved selecting and categorising behaviour change techniques identified within the literature and then using discriminant content validity methods to investigate agreement in this process within a sample of psychologists. Psychologists rated their confidence in mapping 33 behaviour change techniques into at least one of eight behaviour change domains. Confidence ratings were compared to a value of zero within one sample t-tests, and intraclass correlations were calculated to compare agreement between participants. This validated communication tool was then included within a 3-hour educational intervention aiming to improve medical students' ability to engage in constructive obesity management discussions with patients. In the final study, a mixed methods evaluation was conducted to assess the efficacy, feasibility and acceptability of this educational intervention. In this study, a quantitative repeated measures design assessed changes in students' behavioural determinants (relating to engaging in obesity management discussions with patients), and skills. A qualitative content analysis explored students' satisfaction with the education itself and finally, a fidelity analysis was conducted using audio-recordings of the education to assess tutors' consistency in delivering the session in accordance with a provided intervention protocol.

Section one summary

Section one has outlined the rationale for studying obesity, and more specifically obesity management education for medical students. It is apparent that the health implications of obesity are severe and rising. These implications affect healthcare systems and also the roles that medical professionals now have in caring for their patients. Approaches to combating obesity are varied and have been informed to different extents by evidence and theory. There is however, an existing evidence-base identifying theoretically informed behaviour change techniques, and although it is recognised that this understanding should contribute to preparing medical students for practice within their undergraduate careers, it remains unclear to what extent this has been achieved. Further, there may be barriers to the inclusion of obesity management education both at individual and institutional levels and these are yet to be fully explored. The current thesis reports an investigation of some of these issues so that empirical evidence is contributed to existing knowledge about what influences current obesity management education, and also identify what may constitute effective education in this area.

**SECTION TWO: IDENTIFYING AND INVESTIGATING OBESITY MANAGEMENT
EDUCATION WITHIN MEDICAL SCHOOLS**

Section two introduction

The focus of Section two is the investigation of existing obesity management education within undergraduate medical programmes. It takes an exploratory approach to identifying the available evidence on effective obesity management education and also reports on research seeking to identify the challenges and solutions to its integration within medical schools. This section contains three chapters, all of which are presented as journal articles rather than descriptive thesis sub-sections. Chapter 5 contains a systematic review of educational interventions in order to identify examples of effective obesity management education. Chapter 6 describes another systematic review which identifies how researchers have used behaviour change techniques to inform obesity management education for medical and nursing students. Chapter 7 takes a different approach, reporting a qualitative study with medical educators on their views and experiences of integrating obesity management education into undergraduate medical programmes. The section ends with a summary of these studies' conclusions and contributions to the literature.

**Chapter 5: Preparing medical students to facilitate lifestyle changes with obese patients: A
systematic review of the literature**

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Conference presentation:	Oral presentation. <i>Division of Health Psychology</i> , University of Southampton, Sept 2011.

Note. *As this paper has been published, the formatting and layout of the below study is in keeping with Academic Medicine's guidelines. Thus, for this chapter only, references for this study will not follow APA style and will be placed at the end of this chapter rather than at the end of the entire thesis.*

5.1 Abstract

Purpose. Doctors will increasingly encounter opportunities to support obese patients in lifestyle change efforts, but the extent to which medical schools prepare their students for this challenge is unknown. Further, despite evidence indicating that theory-based techniques are effective in facilitating patients' behavioral changes, the methods taught to medical students and the means of content delivery are unclear. The authors reviewed the literature to investigate how effective educational interventions are in preparing medical students to facilitate lifestyle changes with obese patients.

Method. The authors systematically searched Excerpta Medica (EMBASE), PsycINFO, MEDLINE, and Scopus for educational interventions on obesity management for medical students published in English between January 1990 and November 2010 and matching PICOS (Population, Interventions, Comparators, Outcomes, Study design) inclusion criteria.

Results. Results of a narrative synthesis are presented. Of 1,680 studies initially identified, 36 (2%) full-text articles were reviewed, and 12 (1%) were included in the final dataset. Eleven (92%) of these studies had quantitative designs; of these, 7 (64%) did not include control groups. Nine (75%) of the 12 studies were atheoretical, and 4 (33%) described behavior management strategies. Despite positive reported outcomes regarding intervention evaluations, procedures to control for bias were infrequently reported, and conclusions were often unsupported by evidence.

Conclusions. Evidence from this systematic review revealed data highly susceptible to bias; thus, intervention efficacy could not be determined. Additionally, evidence-based strategies to support patients' obesity-related behavior changes were not applied to these studies, and thus it remains unknown how best to equip medical students for this task.

5.2 Introduction

Obesity directly contributes to common long-term illnesses including type 2 diabetes, some cancers, and cardiovascular disease.^{1,2} In 2008, one in nine adults worldwide were considered obese (defined as having a body mass index [BMI] ≥ 30 kg/m²).³ Obesity, which has been labeled a global epidemic,⁴⁻⁶ also leads to escalating financial consequences and increasing workloads for healthcare systems. Each year, one-sixth of the U.S. healthcare budget (approximately \$168 billion or £110 billion)⁷ and \$6.6 billion or £4.2 billion in the United Kingdom⁸ is spent on illnesses caused by obesity. Because initiatives to combat obesity are urgently needed in most countries,³ it is crucial to identify the most effective methods of obesity management, particularly those to which healthcare systems can make contributions.

This article's focus is on the prevention and control of obesity through behavioral management approaches (e.g., changes in diet and activity)^{1,9} rather than alternative methods (e.g., pharmacological or surgical interventions). Making sustained changes to obesity-related behavior is a notoriously difficult task, and success is influenced by various epidemiological and psychological factors.¹⁰⁻¹² Additionally, obesity is a socially sensitive subject with the potential to damage the patient–practitioner relationship.¹³

Traditional knowledge-enhancing approaches within healthcare (in which patients are provided with only generic risk information) have been shown to be less successful in eliciting lifestyle changes than methods that address specific determinants of patients' behavior defined within theoretical frameworks.^{1,14-16} Because the latter approach allows tested, targetable factors to be identified,¹⁷ health care governing bodies are increasingly recognizing that health-related behavior change interventions should be based on relevant theories.^{18,19}

Progress in the area of theory-based behavior change derives from a recently developed taxonomy that encompasses motivation, action, and organization theories²⁰ and associated

effective behavior change techniques (e.g., motivational interviewing [MI], goal setting, and stress management).¹⁷ Thus, there is opportunity to develop educational interventions targeting these techniques; some efforts to do so have been successful, particularly with regard to training medical professionals to use MI without increasing overall consultation times.^{21,22}

Opportunities to discuss lifestyle changes are often missed, however.^{23,24} It is well documented that clinicians feel unconfident, unskilled, and uncertain about their specific roles and responsibilities in addressing behavior change with obese patients.^{1,13,25–27} Research nonetheless suggests that patients want their doctors to take a more active role in encouraging them to change their diet and physical activity patterns,²⁸ and clinical guidelines recommend that physicians tackle obesity with patients through implementing tailored plans and exploring barriers to change.²⁹ Moreover, even though lifestyle change discussions are most effective when they are theory based,^{30,31} this approach is not yet used regularly in medical practice.³² Because medical education ultimately affects the quality of patient care and patient outcomes,³³ educators should consider how medical students are being prepared for the complex and increasingly common task of discussing behavior management strategies with obese patients.

Within the United Kingdom, *Tomorrow's Doctors* (2009)³⁴ stipulates that, as scholars and scientists, medical school graduates should be able to “discuss psychological aspects of behavioral change and treatment compliance” (section 9e) and, as practitioners, to “communicate appropriately in difficult circumstances, such as when breaking bad news, and when discussing sensitive issues such as alcohol consumption, smoking or obesity” (section 15d). Researchers also advocate training medical students in “patient activation” methods (such as MI), which stimulate patients to take responsibility for their own health, in order to create stronger pathways between medical education and meaningful patient outcomes.³³

Yet, areas of medicine encompassing obesity management (e.g., health promotion/preventive care) are poorly established within medical school curricula.³⁵⁻³⁹ Although many medical students view obesity management as an important aspect of the physician's role, their knowledge and satisfaction with associated education is significantly lower than that reported by student dietitians.⁴⁰ In one study, 60% of responding primary care physicians reported that they had been provided with insufficient knowledge to be able to address unhealthy eating patterns with patients.⁴¹

Although these and other studies suggest a paucity of obesity-related education in medical schools,⁵ empirical investigations have not identified the extent to which current understanding of how to support patients' health-related behavior changes^{42,43} is represented within medical education, or what the most effective educational methods may be. We aimed to fill this gap by conducting a systematic literature review to investigate the following research question: How effective are educational interventions in preparing medical students to facilitate lifestyle changes with obese patients?

5.3 Method

Search strategy

In July 2010, one author (A.C.) conducted preliminary searches for relevant studies using key terms (e.g., *obesity*, *medical students*) within medical and social science databases. She refined these searches to identify studies that included literature reviews and searched the online Cochrane Library database, but she found no previously published systematic reviews on obesity management education for medical students.

Between July and November 2010, A.C. systematically searched the following electronic databases for relevant studies: MEDLINE, Excerpta Medica (EMBASE), PsycINFO, and Scopus. In

line with Centre for Reviews and Dissemination (CRD) recommendations,⁴⁴ we developed our search strategy using a PICOS (Population, Interventions, Comparators, Outcomes, Study design) format, which informed our search terms and inclusion criteria. The selected search terms were based on the target population, interventions (educational sessions for medical students addressing obesity-related behaviors/conditions), and outcomes (see List 1). We did not include terms related to comparators or study design because preliminary searches indicated that relevant studies would likely be omitted if interventions lacked control or comparison groups; thus, particular study designs would be excluded from the review. We combined search term sets (using *AND*) and exploded all search terms using the truncation (\$) and key word advanced search (article title, abstract, full text, and caption text [.mp.]) functions. We also set time frame limitations (publication date of January 1990 through November 2010) in line with emerging calls in the 1990s^{45,46} by health care governing bodies for the inclusion of health promotion and related subjects in the undergraduate medical curriculum. (The full search strategy is available from the authors.)

List 1. Terms Used Within Systematic Review Search Strategy*

1. medical education/ or medical student/ or medical school
2. obesity/ or obes\$.mp.
3. weight gain/ or weight gain\$.mp.
4. weight manag\$.mp.
5. nutrition/ or nutrition\$.mp.
6. diet/ or diet\$.mp.
7. eating/ or eat\$.mp.
8. physical activity/ or jog\$/ or run\$/ or walk\$/
9. sedentary.mp.
10. diabet\$.mp./ or diabetes mellitus
11. paediatric\$.mp. or pediatric\$.mp.
12. heart disease/ or cardiovascular\$.mp.
13. knowledge\$.mp.
14. confiden\$.mp.
15. attitud\$.mp.
16. intention\$.mp.
17. performance\$.mp.
18. skill\$.mp.
19. 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12
20. 13 or 14 or 15 or 16 or 17 or 18
21. 1 and 19 and 20
22. limit 21 to (English language and yr="1990-Current")

* Search term key: \$ = truncation; .mp. = searches title, abstract, full text, caption text; current = November 2010.

Initially, A.C. selected studies for inclusion by screening the titles and abstracts of all studies. Those with features not relevant to the review, such as studies that did not include medical students (e.g., samples of nursing students) or that were not related to obesity (e.g., malnutrition studies), were excluded at this point. Studies with titles/abstracts that presented ambiguous information or did not indicate key details (e.g., identity of the study population) were included so that relevant studies would not be missed. This process was carried out by a single author because study selection was intended to be overinclusive at this stage. A.C. also checked reference lists manually for additional relevant articles, contacted study authors when full study details could not be accessed, and removed duplicates. She then assessed full texts of the remaining articles for eligibility against full PICOS inclusion/exclusion criteria (Table 1).

Table 1. Inclusion and Exclusion Criteria for Systematic Review of the Literature on Educational Interventions for Medical Students Targeting Obesity Management

Category	Inclusion criteria	Exclusion criteria
Population	Medical school students Students may be school leavers or have obtained a university degree prior to medical school entry Medical program may be any length Other participant groups may feature within the sample	Medical trainees post medical school Qualified health care professionals Students of other health care professions (e.g., dietitians, nurses)
Interventions	Educational interventions with the following content explicitly related to obesity: Obesity as a distinct topic Behaviors related to obesity/obesity management (e.g., exercise) Conditions related to obesity (e.g., diabetes) Educational interventions with the following content (deemed as implicitly related to obesity): Increasing physical activity levels Decreasing fat/calorie intake Reducing body mass index (BMI) Weight loss	Intervention topics unrelated to obesity (e.g., malnutrition, general nutrition education) Educational interventions aiming to improve students' health only, with no explicit link to improving patients' health
Comparators	Studies with or without control/comparison groups	Not applicable
Outcomes	Studies with at least one outcome measure and sufficient (quantitative or qualitative) data to describe intervention effects	Studies without any reported outcome data
Study design (and study features)	Any design (except studies without outcome measures) English language only Published 1990–2010 Published/conducted in any country	Insufficient detail to determine any study content

To ensure reliability, a second coder (M.N.), who was not involved with the study, independently repeated the selection process using PICOS eligibility criteria for all of the full-text articles identified by A.C. Results from both coders were compared; the calculated interrater reliability statistics (Cohen $k = 0.89$) demonstrated “almost perfect” agreement⁴⁷ for selection of studies into the final dataset.

Data extraction tools

We developed two tools to enable data extraction: one to identify descriptive data, the other to identify methodological features to inform coder judgments about the quality of the included studies. All authors contributed to the development of these tools through meeting regularly to discuss design issues and subsequent revisions. The preliminary searches indicated that the tools should account for quantitative and qualitative designs as well as studies that did not have robust experimental designs (e.g., those that were not randomized controlled trials). Hence, we drew relevant components (such as study aim, design, and sample) from existing extraction and quality assessment tools used within health care and public health research,^{44,48–51} rather than using any one previously developed tool. We did not, therefore, incorporate redundant components that were not relevant to studies within this review (e.g., blinding to participant group, which is not applicable to studies with only one participant group). Consultations with experienced systematic review researchers (E.H. and another independent researcher, P.B.) further helped us determine which components should be selected so that the most salient information, relevant to the aims of this review, would be collected.

The final versions of our data extraction tools therefore incorporated the following components:

Tool 1, for descriptive data, included study aim, sample, design, intervention content, intervention structure, outcome data, and conclusions. Tool 2, for methodological features, directed coders to evaluate the quality of studies according to three criteria:

- **Intervention transparency:** A study was deemed transparent if either the educational content of the intervention or the intervention evaluation procedures were described within the article. Where possible, coders noted whether descriptions were sufficient to allow for replication and compared notes to reach consensus.
- **Control for risk of bias:** A study was deemed to have attempted to control for bias if it explicitly described measures to overcome potential confounders (i.e., secular trends/selection bias).
- **Conclusions supported by sufficient evidence:** Conclusions were deemed reliable if they were clearly described and did not reach beyond data and if the study design was robust. Coders used descriptive data regarding study designs to support these appraisals.

To test the tools' suitability, three authors (A.C., J.H., S.P.) piloted both tools on two studies and then discussed and dealt with arising queries as a group. For example, piloting indicated that the presence/absence of simple procedures to control for risk of bias (obtaining baseline measures, including control groups, randomization) should be explicitly coded for because some articles did not mention them.

Data extraction

One author (A.C.) completed data extraction using both tools for all articles included in the final dataset. To reduce risk of bias, her results were compared with independent ratings completed by three other research team members (J.H., K.M., S.P.), each of whom coded some articles. Thus, all included studies were second coded. Arising discrepancies were resolved through discussion, with a third team member acting as an arbitrator when necessary.

5.4 Results

A total of 1,680 articles were initially identified by searches and screened for relevance to the research question. Of these, 36 (2%) were reviewed against all eligibility criteria, resulting in 12 articles (1%) being selected for inclusion in the final dataset (Figure 1).

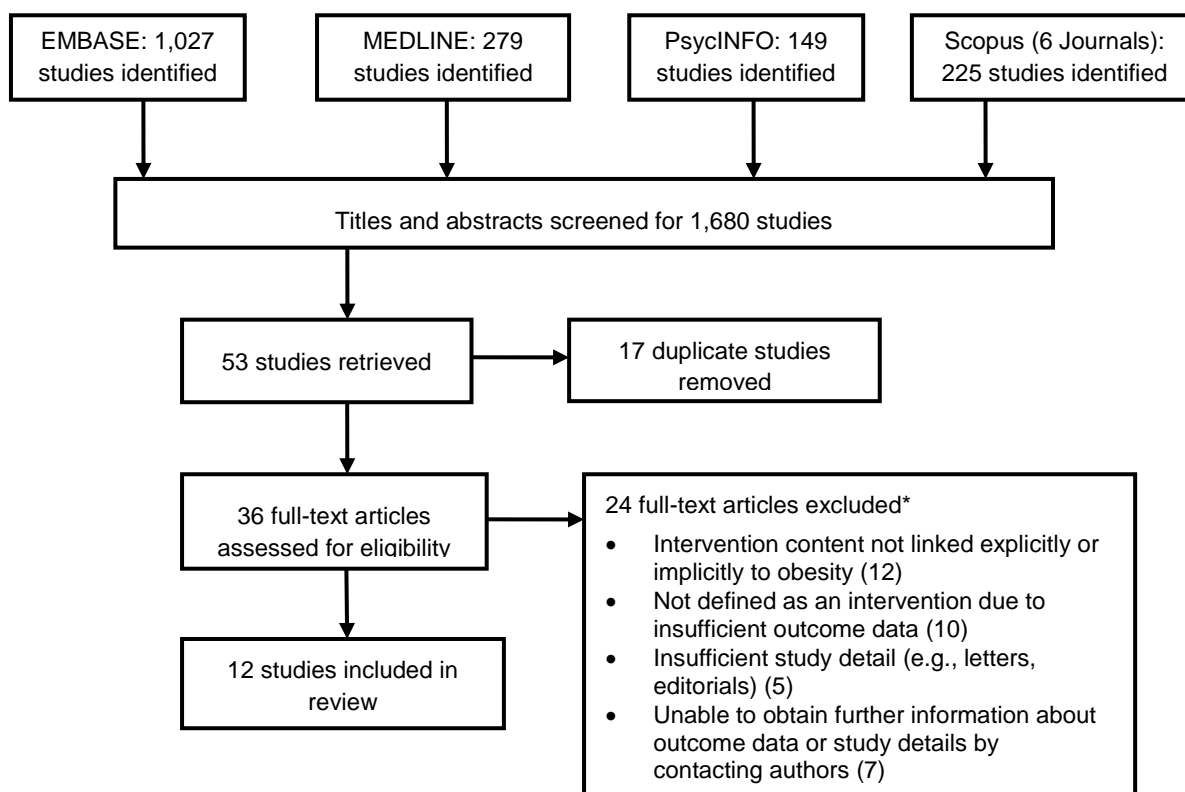


Figure 1 Flowchart of systematic review study selection procedures.

*The total number of excluded studies is >24 because 10 studies were excluded for two reasons

We present a narrative synthesis of the data because of the diversity of methodologies and outcome measures used within the 12 studies; this is in line with CRD recommendations for systematic reviews that are based on heterogeneous groups of studies.⁴⁴ Our findings lie within four categories: study characteristics, intervention structure and content, intervention outcomes and reported results, and risk of bias within studies.

Study characteristics

The 12 educational interventions that met eligibility criteria^{37,38,52-61} were published in a range of academic journals between 1993 and 2010 (6 [50%] within the last five years of this range), and most (n = 9; 75%) were conducted within the United States. Demographic details of study samples were often unreported; data on participant gender were included in 6 (50%)^{52,53,55,57,58,61} (range =

29%–74% female), and ethnicity was included in 2 (17%).^{54,57} One study (8%) had a qualitative design,⁶¹ whereas the other 11 (92%) employed the following quantitative designs: controlled trial (nonrandomized),^{53,54,56,57} before-and-after study,^{38,58,59} or evaluation-only study (no preintervention data obtained).^{37,52,55,60} Of these quantitative-design studies, 7 (64%) did not, therefore, include control groups. Table 2 provides additional details about study characteristics.

Intervention structure and content

Educational interventions on obesity management varied widely in terms of their timing within medical school curricula (Table 2). Interventions occurred within ambulatory care blocks,^{37,38,53} preventive care modules,^{54,57} a first-year introductory course,⁵⁹ a second-year clinical placement,⁵⁵ a third-year family medicine clerkship,⁶⁰ a fifth-year addiction medicine course,⁶¹ or across four separate areas throughout the medical school curriculum.⁵⁶ Insufficient reporting prevented us from identifying this information in two studies (17%).^{52,58}

Table 2

Characteristics of 12 Studies on Obesity Management Educational Interventions for Medical Students Published Between 1993 and 2010*

Source	Country	Participant group: No.	Year at medical school	% Female	Ethnicity (%)	Study design [†]
Barss et al., 2008 ⁵²	United Arab Emirates	Intervention: 50	1	63%	NR	Evaluation-only study
Bell and Cole, 2008 ³⁸	United States	Intervention: 53	3	NR	NR	Before-and-after study
Carson, et al., 2002 ⁵³	United States	Intervention: 156	4	42%	NR	Controlled trial (non-randomized)
		Control: 40	NR	37%	NR	
Conroy et al., 2004 ⁵⁴	United States	Intervention: 137	2	NR	White 54%	Controlled trial (non-randomized)
		Control: 30	2	NR	NR	
Endevelt et al., 2006 ⁵⁵	Israel	Intervention: 122	2	37%	NR	Evaluation-only study
Hodgson, 2000 ⁵⁶	United States	Intervention: 130 [‡]	1, 3, 4	NR	NR	Controlled trial (non-randomized)
		Control: NR	2	NR	NR	
Kashani et al., 1993 ⁵⁷	United States	Intervention: 207	1, 4	29% [§]	White 64.7%, Black 6.8%, Asian 16.4%, Hispanic 9.2%, Other	Controlled trial (non-randomized)
		Control: NR	4	NR	NR	
Kolasa et al., 1999 ⁵⁸	United States	Intervention: 155	1, 3, 4	50%	NR	Before-and-after study

Moser and Stagnaro-Green, 2009 ³⁷	United States	Intervention: 150	3	NR	NR	Evaluation-only study
Poirier et al., 2004 ⁵⁹	United States	Intervention: 42	1	NR	NR	Before-and-after study
Rodríguez and Fornari, 2006 ⁶⁰	United States	Intervention: 18	3	NR	NR	Evaluation-only study
Schroder et al., 2010 ⁶¹	New Zealand	Intervention: 72	5	74%	NR	Qualitative study

* NR indicates that data were not reported within the article.

† Evaluation-only study: measures were administered after implementation only, and there were no baseline measures and no control group; before-and-after study: measures were taken before and after intervention implementation, and there was no control group; controlled trial (non-randomized): measures were taken before and after intervention implementation, and a control group was included, but participants were not randomly assigned to groups; Qualitative study: participant data was obtained following intervention implementation and analyzed using qualitative methods only, and there was no control group.

‡ The pretest N for the study was 130; the number of students in the sample receiving the intervention was not clear.

§ Gender and ethnicity data for this study relate to the intervention group at year 1 of medical school, not at year 4, where demographics may have changed due to attrition (year 4, n = 94).

Appendix 1 shows the variety of health professionals involved in intervention delivery (this was unclear in four studies [33%]), as well as intervention durations (estimated student contact time: median = 20.75 hours, range = 1–99.3 hours). In terms of delivery, the inclusion of didactic sessions was common to most studies (n = 9; 75%)^{37,38,52–57,59}; other educational methods included classroom-based learning, opportunities to practice learned skills, assessment, self-monitoring, and experiential learning.

Whereas five studies (42%) were exclusively related to educational interventions on obesity and the behaviors that govern it,^{55,56,58,60,61} others included education on obesity-related illnesses such as cardiovascular disease and diabetes.^{52,53,55,57} Seven studies (58%) addressed additional health topics, such as smoking and alcohol.^{37,38,52–54,57,59} Despite targeting obesity as a distinct topic within interventions, eight studies (67%) did not describe the strategies provided to students to help them tackle this issue with patients.^{52–58,61} Instead, these reports focused on how interventions were delivered to students. Interestingly, all four studies (33%) that we deemed transparent regarding educational content^{37,38,59,60} described MI techniques; three (25%) explicitly stated that educational content had been informed by theory^{37,38,59} (i.e., transtheoretical model of behavior change [TTM],⁶² health belief model [HBM],⁶³ and social cognitive theory [SCT]).⁶⁴ All three of these studies included the TTM, whereas one study³⁷ also used the HBM and SCT to inform the intervention content.

Intervention outcomes and reported results

The 12 included studies targeted a wide range of outcomes, which are detailed in Appendix 2. Below, we summarize the reported results of interventions by study design. (The results of the qualitative study⁶¹ are summarized in Appendix 2.)

Controlled trials (n = 4; 33%). Although the four controlled trials^{53,54,56,57} evaluated various changes in students' knowledge, confidence, attitudes, and clinical skills as well as in their personal physiological and psychosocial measures, few statistically significant between-group differences were identified. Evidence was particularly limited for student knowledge, confidence, and attitudes (reported, respectively, in one,⁵³ two,^{53,54} and no studies). Findings regarding performance measures were similarly limited: one study⁵³ reported that, after the intervention, students who received the intervention's education sessions were no more likely to engage in nutrition discussions with patients than were students in the control group ($P = .067$). Another study⁵⁷ reported limited improvements to students' diets as well as reduced physical activity levels after the intervention.

Before-and-after studies (n = 3; 25%). All three before-and-after studies^{38,58,59} reported significant postintervention knowledge improvements (of MI and/or the role of nutrition in cancer). Some also reported statistically significant improvements in confidence (counseling patients),^{38,59} attitudes (about physicians' roles),⁵⁸ and MI skills.³⁸ Students reported intentions to change their approach with future patients³⁸ and to spend more time counseling patients⁵⁸ after interventions. Students' perceptions of the educational interventions were generally positive, and two studies reported high levels of satisfaction.^{38,59}

Evaluation-only studies (n = 4; 33%). In the four evaluation-only studies,^{37,52,55,60} self-report measures of knowledge suggested increases in students' understanding about obesity and nutritional risk⁵⁵ and the biopsychosocial approach to patient care.³⁷ Students also reported improvements in their counseling skills,³⁷ general research skills,⁶⁰ and attitudes (being more open to the topic of behavior change).³⁷ Finally, students reported improvements in diet and activity patterns (theirs⁵² or their patients').⁶⁰ Despite these generally positive outcomes, students' evaluations of the educational interventions were mixed.^{55,60}

Risk of bias within studies

Coders' appraisals of study quality were in line with our three main criteria: intervention transparency, control for risk of bias, and conclusions supported by sufficient evidence.

Intervention transparency. Four studies (33%)^{37,38,55,59} included descriptions of educational content that we deemed sufficient to allow for replication. In contrast, nine studies (75%) provided methodological descriptions that we judged would allow for replication.^{37,52–55,57,59–61}

Control for risk of bias. Although seven studies (58%)^{38,53,54,56–59} made attempts to control for risk of bias, these efforts mainly involved baseline measures or control groups. (Only four studies [33%] included both baseline measures and control groups).^{53,54,56,57} None of the studies used randomization procedures or power calculations. Validation procedures for outcome measures were briefly described in five studies (42%),^{38,53,55–57} and participant response rates were below 50% for some outcome measures in four studies (33%).^{38,53,54,57}

Conclusions supported by sufficient evidence. We judged six studies (50%)^{37,38,53,54,59,61} to have sufficiently qualified conclusions with evidence in the article. In evaluating the other six studies,^{52,55–58,60} the coders noted that conclusions were not clearly described, that assumptions reached beyond the results, and that the lack of control within studies prevented the reporting of convincing evidence to support conclusions. In addition, only one study³⁸ calculated the effect sizes of significant differences reported between participant groups.

5.5 Discussion

This systematic review of the literature identified just 12 studies published between 1990 and 2010 about educational interventions for medical students that addressed facilitating lifestyle changes with obese patients. Our analysis of these studies revealed numerous approaches to designing and implementing education in this area, with wide variations in terms of how curricula were structured and delivered (Appendix 1). None of the studies compared approaches, however, and thus the advantages or disadvantages of delivery within particular contexts or by certain individuals remain unclear. Our findings correspond to previous research indicating that education about specific health behaviors (e.g., smoking, physical activity) occurs infrequently within medical education^{65,66} and that general behavior change skills courses often lack consistency and structure in terms of their educational content.^{38,39} This, in addition to reports that frontline medical professionals feel unskilled in obesity management,^{13,40,41} suggests that calls from governing bodies encouraging integration of this topic into medical practice and education have not been met.^{29,34,39} Solving the problems related to integrating relevant content into medical curricula could be key to resolving this; such problems may include a lack of available subject experts, not assessing students' knowledge or skills in this area, or existing perceptions of the topic (e.g., considering it a low-profile subject).^{5,67}

One of our key findings from this review was the lack of theory reported to inform the content of studies' educational interventions. We found that reported educational interventions were mostly atheoretical (75% of the 12 studies), contradicting evidence that theory-based behavior change interventions are the most effective.^{16,31} The few studies in which interventions were theoretically informed used the TTM, which is acknowledged to have a limited evidence base and has received criticism regarding its key assumptions.^{68,69} Further, it has been well documented that the content of behavior change interventions is often not described adequately, making studies difficult to replicate, evaluate, or compare.⁷⁰ This issue clearly emerged within our review: Descriptions of the specific

behavior management techniques taught were rare and, when present, were mostly limited to MI (Appendix 1) even though numerous techniques exist in the behavior change literature.⁷¹ Past interventions to prevent weight gain in community-based contexts can also be criticized for failing to incorporate existing knowledge of behavioral determinants included within theoretical frameworks.⁷² Thus, our findings build on evidence suggesting that practical application of techniques is not developing at the same pace as theoretical advances in behavior change research.³² This issue must be addressed if education provided to medical students in this increasingly important area of medicine is to be considered truly evidence based.

Our findings also highlight concerns regarding the methodological rigor of studies in this review. Although a range of positive intervention outcomes were reported, measures to control for the risk of bias were rare. Just four studies (33%) included both baseline measures and control groups,^{53,54,56,57} and none calculated power or used randomization procedures. Therefore, the evidence provided was insufficient to determine whether the variability reported in outcome measures derived from intervention effects or from other unknown factors. The lack of robust evaluations within the literature we reviewed means that we cannot confidently draw conclusions regarding the efficacy of interventions or the contribution of this literature in informing education within this area.

Our findings should, however, be considered within the strengths and weaknesses of this review. To ensure a rigorous, replicable review of the literature relevant to the study question, we designed a search strategy in line with standardized PICOS criteria.⁴⁴ To reduce risk of bias, we assessed interrater reliability using an independent second coder at study selection. Search criteria were limited to English-language articles and published research, which may have led us to overlook other relevant research. Further, because we did not use existing data extraction tools, it is possible that we developed our tools in line with subjective judgments about what information would be most

appropriate to extract. The methodological diversity of included studies made it more appropriate to select only the most relevant components from certain existing tools,^{44,48–50} thereby excluding many redundant items. Finally, because of our tailoring of data extraction tools to the needs of this review, potentially subjective coder judgments rather than objective criteria informed quality appraisals. Research team members conducted validity checks throughout data synthesis, and coders reached consensus at all stages, which suggests that possible coder bias was prevented.

Despite some limitations, our findings indicate that more work is needed to develop and identify evidence-based educational interventions about obesity-related lifestyle changes. Future research should ensure that intervention content is transparent and that methodological rigor is applied to study designs. Future interventions should specifically apply relevant theories and known behavior change techniques. Additionally, research outside the United States is needed because few medical schools from other countries were represented in this review. We conclude that current educational interventions for medical students that address obesity management are varied, and empirical tests of their efficacy are inadequate. It therefore remains unknown to what extent medical students are being prepared to facilitate important lifestyle changes with future obese patients or what the best methods to achieve this involve.

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5.7 Appendices

Appendix 1. Intervention Content, Structure, and Delivery Procedures of Obesity Management Education Interventions for Medical Students in 12 Studies Identified in a Systematic Review of the Literature*

Source	Intervention content			Intervention structure and delivery		
	Health topics addressed	Explicitly informed by behavior change theory	Techniques included to facilitate patient behavior change	Health professionals involved in delivery	Educational methods and session durations	Estimated student contact time [‡]
Barss et al., 2008 ⁵²	Child obesity, weight loss (in nursing home patients), nutrition/diet, exercise, smoking, home and car safety, yoga of praying, cancer, CVD, osteoporosis, hypertension, food-borne diseases	NR	NR	Faculty from Community Medicine and Medical Education departments	Five lectures; students conducted home interview (family's lifestyle history and observation of lifestyle behaviors); students assessed own lifestyle (1-week activity log, computer-based assessment, manual BMI measurement); student oral presentations (to peers and faculty)	NR
Bell & Cole, 2008 ³⁸	Weight loss, smoking, alcohol, medication adherence	Stages of change	MI techniques: Assess readiness to change (interest, confidence, readiness on a scale of 1–10), mutual agenda setting, decisional balance, individualized feedback, ask “where do we go from here?,” negotiate change plan; OARS	A primary care physician, a social worker, a graduate student educator	Four 2-hour sessions over 4 weeks, including didactics (MI principles/practice), role-play, video demonstrations and recordings of student–patient interactions, peer review, group discussion/brainstorms, trainer observation and feedback; pre- and post-course assessments	8 hours
Carson, et al., 2002 ⁵³	Obesity, nutrition/diet, alcohol, CVD, hypertension, hypercholesterolemia, hyperlipidemia, diabetes	NR	NR	A physician and a dietician	Compulsory lectures (twice weekly for 4 weeks); participation in various clinics (6 half-days [estimated at 4 hours each] per week, for 4 weeks); 2 web-based patient cases (averaging 2.3 hours to complete); resource materials and pocket reference cards provided; role modeling (physician/dietician input into computerized patient cases); 1 hour class discussion—students created management plans for patient cases and received feedback on them	99.3 hours
Conroy et al., 2004 ⁵⁴	Obesity, nutrition/diet, exercise, screening, immunization	NR	NR	A dietician	14 weekly sessions including 45-minute lectures and 90-minute PBL tutorials; simulated cases to teach counseling skills; student-led debates; final exam; self-assessment of students' health behaviors via food-frequency questionnaire (with feedback on results); completed and analyzed personal diet record (reviewed with a dietician)	31.5 hours
Endevelt et al., 2006 ⁵⁵	Obesity, overweight, nutrition, diabetes	NR	NR	NR	Workshop involving 4 lectures (and associated reading); practice interviewing and assessing patients about nutrition; PBL case; presentation defending one type of obesity treatment; class discussion	10 hours
Hodgson, 2000 ⁵⁶	Nutrition/diet	NR	NR	NR	10 lectures; 2 PBL cases; laboratory exercises to practice nutrition skills; dietary self-assessment; standardized patient interviews	NR
Kashani, et al., 1993 ⁵⁷	Nutrition/diet, physical activity, smoking, CVD, diabetes, depression	NR	NR	Senior medical students, physical education and nutrition students, preventive medicine	Didactic sessions; extensive feedback to students with “at risk” behavioral/physiological assessment findings; clinical setting experiences (clinical practice exposure, working with preventive cardiology faculty)	NR

				residents, trained pulmonary function technicians, faculty physicians, dieticians, psychologists		
Kolasa et al., 1999 ⁵⁸	Maintaining healthy weight, nutrition/diet, alcohol, cancer	NR	NR	NR	Computer-based (CD-ROM) patient case simulations of a breast cancer case (median completion time = 60 minutes) and a lung and a colon cancer case (median completion time = 90 minutes each). Included information on risk factors for cancer, short modules, animations, video interviews with experts, video clip demonstrating nutrition counseling, graphics, dialogue with computer about students' knowledge of cancer risk factors (i.e., free-form answers with new/correct information fed back to students). Students' performance saved by computer and reviewed by an instructor	1-1.5 hours [†]
Moser & Stagnaro-Green, 2009 ³⁷	Obesity, smoking, exercise, nutrition/diet, yoga, medication adherence, medically unexplained symptoms	Health belief model, social cognitive theory, stages of change	MI techniques: Decisional balance, assess/activate readiness to change through targeting theoretical constructs (e.g., perceived susceptibility/severity); construction of biopsychosocial care plans	NR	Four week course (15 hour curriculum; 5 half-day ambulatory sessions in internal medicine), including interactive lectures, MI workshops (skills practice), standardized patient (SP) interviews, group interviews, video assessment of SP interviews (VASE-R), role-plays, stages of change video, discussion, community group project, individual wellness plans by and for students, observation of stages of change model used (smoking cessation community program), reflective journals, completion of decisional balance sheets and smoking cessation forms, formative feedback via learning quizzes, and exams	60 hours
Poirier et al., 2004 ⁵⁹	Obesity, smoking, medication compliance, sedentary lifestyle, alcohol, exercise	Stages of change	MI techniques: Reflective listening, decisional balance, assess readiness to change; FRAMES; OARES	General internist, psychiatrist/psychologist (with special interest in behavior change), nicotine dependence counselors	Five 2-hour sessions including didactic presentations, small group exercises, role-play (observation and performance feedback), counseling skill practice (reflective listening with vignettes), reading material on MI interventions and assessing patients' readiness to change, interview skills checklist (with immediate feedback), discussion, demonstrative video clip (students then offered other examples of reflective listening statements), practice developing statements to diffuse patient resistance, sandwich feedback (positive, negative, positive comments)	10 hours
Rodriguez & Fornari, 2006 ⁶⁰	Obesity, nutrition/diet, exercise	NR	Stress management (no further detail)	NR	Practical implementation of lifestyle modification interventions designed by students, 2 days weekly for 4 weeks. In pairs, students visited obesity groups to give patients tools to change their behaviors (8-12 hours per week, 4 weeks)	32-48 hours
Schroder et al., 2010 ⁶¹	Overeating, diet	NR	NR	Representatives from an OA group	Students attended and observed an OA meeting in the community and submitted a reflective report of their experiences	NR

* CVD indicates cardiovascular disease; FRAMES, Feedback, Responsibility, Advice, Menu, Empathy, Self-efficacy; MI, motivational interviewing; NR = not reported within article; OA = Overeaters Anonymous; OARES: Open-ended questions, Affirmations, Reflective listening, Elicit self-motivational statements, Summarize; OARS: Open-ended questions, Affirmations, Reflections, Summarize; PBL, problem-based learning. [†] One student spent 4 hours on the program. [‡] Estimated contact time relates to duration of the entire intervention (not exclusively the time involving obesity-management education).

Appendix 2. Details of Reported Outcomes for Educational Interventions on Obesity Management for Medical Students in 12 Studies Identified in a Systematic Review of the Literature*

Source	Specified learning/intervention outcomes [data collection tools]	Respondents: No. of participants (% of total sample†)	Statistical analysis of intervention outcomes	Main findings reported
Barss et al., 2008 ⁵²	<ul style="list-style-type: none"> • Counseling knowledge and skills; change in students' health behavior • Attitudes on importance of community medicine/population health [self-report questionnaire] 	27 women, 16 men (86%)	%, McNemar test, 95% CIs, <i>P</i> values	<ul style="list-style-type: none"> • Increased awareness of health behaviors/counseling knowledge (53%/42% strongly agreed), improved observational skills (53% agreed) • 35–74% reported unspecified level of change across 10 separate behaviors relating to their diet/exercise (<i>P</i> < .0004 for 6 of these 10 behaviors) • 7–74% reported unspecified changes to 5 other health behaviors (relating to smoking, car safety and food hygiene)
Bell & Cole, 2008 ³⁸	<ul style="list-style-type: none"> • MI knowledge, confidence, skills [quiz, self-report, objective assessment] • Intervention evaluation [scaled questionnaire] • Student intentions to modify patient consultations [commitment to change (CTC) statements; followed up via online survey] 	<ul style="list-style-type: none"> • Knowledge/confidence/skills: 50 (94%) • Evaluation: 53 (100%) • CTC survey: 24 (45%) 	<ul style="list-style-type: none"> • Knowledge/confidence /skills/evaluation: paired t-tests, mean, %, <i>P</i> values, Cohen's <i>d</i> (skills only) • CTC: % implemented 	<ul style="list-style-type: none"> • Increased knowledge, confidence assessing/counseling patients (all <i>P</i> < .001) • Total MI skills increased (<i>d</i> = 1.54, <i>P</i> < .001) • Intervention rated as positive (94%), valuable (91%), and satisfaction increased (<i>P</i> < .001) • 81% of CTC statements were reported as partially/fully implemented, barriers included lack of opportunity/time
Carson, et al., 2002 ⁵³	<ul style="list-style-type: none"> • Knowledge (cardiovascular nutrition), self-efficacy (identifying/advising patients), attitudes (importance of addressing cardiovascular nutrition/dietary change) [objective questionnaire] • Skills (frequency of consultations addressing nutrition) [audited chart notes] 	<ul style="list-style-type: none"> • Questionnaire: intervention, 156; control, 40; (100%) • Audit: Intervention, 51 (33%); control, 22 (55%) 	<ul style="list-style-type: none"> • Questionnaire: paired t-test, means, SD, 2x2 repeated measures ANOVA, <i>P</i> values • % audit data • Correlations, R2 	<ul style="list-style-type: none"> • Increased knowledge (intervention group only; <i>P</i> < .001); self-efficacy (group by time effect <i>P</i> < .001); attitudes (equal for both groups, group by time effect <i>P</i> = .983) • Independent predictors of self-efficacy were knowledge and attitudes (reported post-intervention), and self-efficacy (reported pre-intervention) • 252 chart notes reviewed: nutrition addressed in 36% of intervention group and 25% of control group consultations (<i>P</i> = .067)
Conroy et al., 2004 ⁵⁴	Student health behavior change (including diet/exercise patterns), confidence assessing and facilitating	For baseline/follow up: <ul style="list-style-type: none"> • intervention: 	Survey means, standard error, McNemar's test, paired t-tests, <i>P</i> values	<ul style="list-style-type: none"> • Improved confidence (<i>P</i> < .001) and diet/exercise patterns (72%/18% of intervention group)

	behavior change with patients [self-report survey]	134/118 (98%/86%) • control: 23/13 (77%/43%)		• No significant differences for control group
Endevelt et al., 2006 ⁵⁵	<ul style="list-style-type: none"> • Nutrition/obesity knowledge [MCQs] • Student evaluations importance/relevance, quality of teaching [scaled questionnaire] 	Both measures: 122 (100%)	<ul style="list-style-type: none"> • MCQs: % correct • Questionnaire: means, SD 	<ul style="list-style-type: none"> • MCQs: correct answer range across both cohorts = 61%–100% • Intervention evaluations: overall ratings range = 3.4–5.7 (out of 7)
Hodgson, 2000 ⁵⁶	Nutrition knowledge [objective progress survey, assessing confidence]	<ul style="list-style-type: none"> • Pre-test (intervention): 130 (88%) • Post-test time points, intervention: 136 (93%), 89 (72%), 53 (70%), 20 (83%); control: NR 	<ul style="list-style-type: none"> • Confidence scored by “don’t know” response frequency: +1 = correct, -1 = incorrect, 0 = don’t know • Survey means, SD • Repeated-measures ANOVA: f (df), <i>P</i> values 	<ul style="list-style-type: none"> • Overall knowledge increase, $f = 23.3$ (4, 16), $P < .001$ • Pre–post intervention: correct answers increased $f = 61.89$ (3, 21), $P < .001$; “don’t know” answers decreased, $f = 64.69$ (3, 21), $P < .001$; incorrect answers increased, $f = 3.70$ (3, 21) $P < .05$ • No knowledge differences between control and intervention groups (details reported elsewhere)
Kashani et al., 1993 ⁵⁷	<ul style="list-style-type: none"> • Preventive cardiology attitudes; cardiovascular risk factor knowledge [self-report questionnaire] • Student health [various psychosocial, behavioral, physiological measures] 	94 (45%) in intervention group completed all intervention measures; control group, NR	Paired and independent sample t-tests (means, SD, <i>P</i> values)	<ul style="list-style-type: none"> • No significant differences found between knowledge/attitudes of the intervention and control groups ($P = .05$) • Fat consumption reduced among men only (difference between gender groups, $P < .001$) • Physical activity frequency reduced among intervention group men and women ($P < .05$)
Kolasa et al., 1999 ⁵⁸	<ul style="list-style-type: none"> • Knowledge [objective questionnaire] • Attitudes towards intervention content, about role of physician in nutrition counseling, ease in using program [scaled/open questionnaire] • Intention to use learned counseling skills [self-report questionnaire] • General impression of intervention [talk aloud method: students videotaped describing their thoughts as they used the computer program (CD-ROM)] 	147 (95%) completed all intervention measures	<ul style="list-style-type: none"> • Knowledge: % correct answers • Attitudes: %, chi-squared test, <i>P</i> values 	<ul style="list-style-type: none"> • Increased knowledge about 4 of 7 assessed dietary principles related to cancer ($P < .001$) • Increased beliefs that nutrition has an important role in cancer risk and physicians have a role in counseling ($P < .001$) • 93% intended to alter their approach to patient/personal health behaviors, 62.6% would increase time spent counseling, 25% would plan more nutrition discussions with patients • 22% felt program was time consuming; “almost all” agreed that students would complete it only if it was compulsory

Moser & Stagnaro-Green, 2009 ³⁷	<ul style="list-style-type: none"> • Knowledge (of health models), attitudes (towards behavior change), behavior change counseling skills [self-report questionnaire] • Intervention evaluation [informal student/faculty feedback] 	Questionnaire: 149 (99%)	Questionnaire means, SD: Outcomes assessed by 5-point Likert scale (e.g., the course enhanced my knowledge 1 = not at all; 5 = to a high degree)	<ul style="list-style-type: none"> • Perceived knowledge increases (means ranged from 3.9–4.5 on 9 knowledge items), skills development (mean = 4.2, SD = 0.8 on 1 skills item), attitude change (mean = 4.2, SD = 0.9 on 1 attitude item)
Poirier et al., 2004 ⁵⁹	<ul style="list-style-type: none"> • Confidence in behavior change communication skills [self-report questionnaire] • MI knowledge [MCQs] • Intervention evaluation (helpfulness of teaching/course materials) [scaled questionnaire] 	<ul style="list-style-type: none"> • Questionnaire and MCQs baseline/follow up: 42 (100%)/36 (86%) • Evaluation, 35 (83%) 	<ul style="list-style-type: none"> • Confidence: % responses, two-tailed <i>P</i> values from signed rank test • MI knowledge: % correct MCQs, two-tailed <i>P</i> value from sign test of discordant responses 	<ul style="list-style-type: none"> • Confidence increased pre- to post-intervention (all items <i>P</i> < .001 on signed rank test) • Knowledge increased in two of four MCQs (<i>P</i> < .05); overall knowledge increased (<i>P</i> < .005) • Intervention evaluation: Students rated role play and faculty interaction as most helpful
Rodríguez & Fornari, 2006 ⁶⁰	<ul style="list-style-type: none"> • Research skills development: collecting data/interpreting results [self-report scale] • Intervention evaluation [student survey] • Patient health behavior change [self-report questionnaire] 	NR	Survey response averages and %	<ul style="list-style-type: none"> • Improved research skills reported (average rating ≥ 2.5 for all 6 items, on scale where 1 = not at all, 2 = somewhat, 3 = substantially improved) • All students reported the intervention met/exceeded expectations and would recommend it to peers • Patients reported healthier eating/activity patterns (62%) and decreased waist circumference (46%)
Schroder et al., 2010 ⁶¹	Understanding about the concept and experiences of those suffering from addictive overeating [assessed through thematic analysis of student reflective reports]	72 (100%)	Narrative description of thematic analysis	<p>Three emergent themes:</p> <ul style="list-style-type: none"> • Concept of addictive overeating was novel to students • Students discovered food caused disruption to sufferers' lives and highlighted emotional and social consequences of addictive overeating • OA visit as a learning tool: Students felt able to advise patients (referral) and were more comfortable talking with patients about food

*ANOVA indicates analysis of variance; CI, confidence interval; df, degrees of freedom; f, frequency; MCQs, multiple choice questions; MI, motivational interviewing; NR, not reported within article; OA, Overeaters Anonymous; SD, standard deviation; SE, standard error; VASE-R, video assessment of simulated encounters-revised. † Total participant group sizes are reported in Appendix 1.

**Chapter 6: Identifying theory-based behaviour change techniques within obesity management
education for medical and nursing students**

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6.1 Abstract

Objective. To identify the extent to which theory-based behaviour change techniques (BCTs) are used within obesity management education for medical and nursing students.

Design. Systematic review and content analysis study to identify BCTs within multiple educational interventions.

Method. A systematic review of the literature was initially conducted to identify obesity management education for medical and nursing students. A coding scheme informed by standardised definitions of theory-based BCTs (Michie et al., 2011) was modified to identify BCTs within articles identified by the review. Analysis involved identifying the frequency of BCTs reported within content descriptions of education interventions.

Results. Seven articles were identified by literature reviews. Seven different BCTs were identified within included articles. Thus 34 out of 40 possible BCTs (within the coding manual) were not included within descriptions of obesity education for medical and nursing students. Motivational interviewing and general communication skills were most commonly included.

Conclusion. Standardised reporting of BCTs within educational interventions is needed to improve transparency of this literature. Findings suggest BCTs are underused within medical education, and that poor translation between psychological understanding about how to support patients with obesity-related behaviour change and current medical education. This is especially relevant due to current emphasis on the importance of health behaviour change and calls for health professionals to improve competencies in this area.

6.2 Introduction

Over the last 30 years significant advances have been made towards explaining and predicting individuals' health behaviours. This has been largely due to the development and application of theories such as the Theory of Planned Behaviour (Ajzen, 1985), the Health Belief Model (Becker, 1974), the Transtheoretical Model of Behaviour Change (Prochaska & DiClemente, 1984), Control Theory (Carver & Scheier, 1982) and many others (see Armitage & Conner, 2000; Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008; Webb, Sniehotta, & Michie, 2010). Because these theories identify specific antecedents of behaviour (e.g. salient cognitions or social factors) they have informed current understanding about what prompts individuals to engage in key determinants of health and illness including smoking (Norman, Conner, & Bell, 1999), weight loss behaviours (Schifter & Ajzen, 1985), physical activity (Marshall & Biddle, 2001), drug use, caffeine and alcohol consumption (Webb et al., 2010). By unravelling some of the complexities involved in understanding positive and negative health behaviours, researchers have been provided with opportunities to intervene and support people in achieving health-oriented behaviour change (Noar & Zimmerman, 2005).

In support of these developments, research suggests that the most effective behaviour change interventions are theory-based (Jepson, 2000; Kok, 1997; Marteau, 2001; Taylor, 2012), and that ineffective strategies often fail to target specified behavioural determinants. Approaches unlikely to elicit desired changes include direct persuasion (Britt, Hudson, & Blampied, 2004; Leventhal et al., 1997), offering incentives (Cahill & Perera, 2008; Paul-Ebhohimhen & Avenell, 2008), and scare tactics (Leventhal, 1971). Moreover, because these strategies don't recognise the importance of tailoring interventions to individuals they may even reduce motivation to change (Marshall & Biddle, 2001; Ogilvie, Egan, Hamilton, & Petticrew, 2004; Webber, 2009) and cause disengagement with health advice (Bellamy, 2004; Britt et al., 2004).

Paradoxically, behaviour change interventions within the literature are often atheoretical. Systematic reviews have highlighted that theoretical frameworks are underused within behaviour change research (Hardeman, Griffin, Johnston, Kinmonth, & Wareham, 2000; Jepson et al., 2000), and healthcare governing bodies (including the World Health Organisation and the Medical Research Council) now encourage all interventions for health-related behaviour to be based upon relevant theories (Michie, Johnston, Francis, Hardeman, & Eccles, 2008; World Health Organisation, 2002). Together this suggests that despite increasing understanding about the determinants of health behaviours, sufficient application to intervention research has not been achieved.

In addition to the limited application of theory, behaviour change research has also been criticised for inadequate reporting transparency. In particular, it has been highlighted that BCTs are rarely specified within descriptions of various behaviour change interventions (Michie & Abraham, 2004; Stavri, Beard, West, & Michie, 2009). Without clear descriptions of potentially efficacious intervention components, adequate replication and evaluation of these studies is prevented. It may be due to these issues that the practical application of behaviour change theory has been slow (Dombrowski, 2009). However, substantial efforts have been made to improve intervention reporting quality. For example, the importance of using reporting frameworks such as the CONSORT (Moher, Schulz, & Altman, 2001) and TREND statements (Des Jarlais, Lyles, Crepaz, & the TREND Group, 2004), is now widely recognised. In response to calls for even more detailed specification of behaviour change strategies within interventions (Abraham & Michie, 2008), behaviour change taxonomies have been developed to support researchers in adopting a standardised vocabulary of theory-based BCTs (Dixon & Johnston, 2010; Michie et al., 2011). Thus there is increasing awareness about the necessity of fully describing the underlying theory and behaviour change strategies within reports of interventions.

One area where it might be expected that the application of these recommendations has begun, is that of educational interventions for health professionals. Encouraging behaviour change in patients is an increasing role for health professionals due to the prominence of lifestyle-related illness in today's society (Moon, Quarendon, Barnard, Twigg, & Blyth, 2007; Wise, 2011; World Health Organisation, 2008b). Health professionals are therefore expected to have specific competencies in behaviour change skills (Dixon & Johnston, 2010; GMC, 2009; NHS Yorkshire and Humber, 2011). Supporting patients with weight management is one important aspect of modern health professionals' skill set as overweight and obesity are rapidly increasing around the globe, contributing substantially to ill health (Alpert & Powers, 2005; McQuigg, Brown, & Broom, et al., 2005; Treyzon, 2005; Wise, 2011). As doctors and nurses are expected to take an active role in this area, it is unsurprising that they frequently deliver obesity-related behaviour change interventions (Counterweight Project Team, 2008; Katz & Faridi, 2007; Whittemore, Melkus, Sullivan, & Grey, 2004).

However, research highlights that doctors and nurses require educational interventions to assist in overcoming a number of inter-personal and contextual barriers preventing constructive behaviour change discussions with patients (Chisholm, Hart, Lam, et al., 2012; Keyworth, Peters, Chisholm, & Hart, 2012). Common barriers include a lack of time, confidence and skills to manage behaviour change with patients; ambiguity around the extent of the health professional's role, and desire to avoid damaging the health professional-patient relationship (Brown & Thompsen, 2007; Chisholm, Hart, Lam, et al., 2012; Huang et al., 2004; Keyworth et al., 2012). Obesity management is also reported to be particularly challenging for health professionals due to its socially sensitive nature (Brown & Thompsen, 2007; Chisholm, Hart, Lam, et al., 2012).

In order to overcome these challenges for doctors and nurses, undergraduate education may be a valuable point of evidence-based intervention as it provides foundations for students' attitudes and

skills, and may ultimately affect patient outcomes (Kalet et al., 2010). In line with this, the General Medical Council (GMC) now specifies that medical students should graduate with the ability to discuss behaviour change and obesity with patients (GMC, 2009). Furthermore, throughout their pre-registration training, nurses are also expected to obtain competencies in public health approaches including recognising and responding to major determinants of health (Nursing & Midwifery Council, 2010). This suggests an increasing focus within undergraduate education on preparing doctors and nurses for managing behaviour change topics such as obesity with future patients.

Although obesity management interventions are often delivered by doctors and nurses, and government bodies advocate education to prepare them for this task, less attention has been paid to exploring the content or evaluating educational interventions for health professionals in this area. Furthermore, the extent to which current knowledge about theory-based BCTs has been translated to this area remains unknown. This study therefore aimed to assess that extent to which theory-based BCTs are used within educational interventions on obesity management for medical and nursing students.

6.3 Method

Overview of study design

Initially, a systematic review of the literature was conducted to identify research articles describing the content of obesity management education for medical and nursing students. Following identification of relevant articles, a coding scheme comprising definitions of theory-based BCTs (Michie et al., 2011) was used to identify the frequency of different BCTs described within education descriptions.

Identification of education protocols

Peer reviewed journal articles describing obesity management education for undergraduate medical and nursing journals were sought using search strategies based upon PICOS (Population, Intervention, Comparators, Outcomes, Study design) criteria (CRD, 2009). Full details of the search strategy are described elsewhere (Chisholm, Hart, Mann, Harkness, & Peters, 2012; Fillingham, Peters, Chisholm, & Hart, 2012). These systematic searches elicited the identification of 2,138 research articles (1,680 medical student and 458 nursing student articles). Following screening of titles and abstracts by two of the authors (AC, AF), 74 full text articles were retrieved (36 medical student and 38 nursing student articles). From this point, specific eligibility criteria for the present study were developed to focus on identifying descriptions of obesity management education within the remaining articles (n = 74). Articles did not have to present complete interventions with defined outcomes or evaluation data, but they were required to include a description of relevant education describing at least one BCT consistent with Michie et al's (2011) taxonomy definitions (see Table 1). One author (AC) initially reviewed all full text articles against the eligibility criteria and subsequent discussion with all the authors resulted in 100% agreement on the final sample.

Table 1. Inclusion and exclusion criteria for articles included within the study

	Inclusion criteria	Exclusion criteria
Population	<ul style="list-style-type: none"> • Medical/nursing school students • Students may be school leavers or have obtained a university degree prior to medical school entry • University program may be any length • Other participant groups may feature within the sample 	<ul style="list-style-type: none"> • Medical/nursing trainees post medical school • Qualified healthcare professionals • Students of other healthcare professions (e.g., dieticians)
Intervention	<ul style="list-style-type: none"> • Educational interventions with the following content explicitly related to obesity: <ul style="list-style-type: none"> ○ Obesity as a distinct topic ○ Behaviours related to obesity/obesity management (e.g., exercise) ○ Conditions related to obesity (e.g., diabetes) • Educational interventions with the following content (deemed as implicitly related to obesity): <ul style="list-style-type: none"> ○ Increasing physical activity levels ○ Decreasing fat/calorie intake ○ Reducing body mass index (BMI) ○ Weight loss • Educational interventions including at least one BCT meeting a definition from Michie et al's (2011) taxonomy 	<ul style="list-style-type: none"> • Intervention topics unrelated to obesity (e.g., malnutrition, general nutrition education) • Educational interventions aiming to improve students' health only, with no explicit link to improving patients' health • Descriptions of individual elements of interventions only e.g. student examinations only or descriptions of possible intervention materials • Intervention descriptions do not describe specific BCTs
Comparators	Studies with or without control/comparison groups included	Not applicable
Outcomes	Not applicable	Not applicable
Study design (and study features)	<ul style="list-style-type: none"> • Any design • English language only • Published 1990–2010 • Published/conducted in any country 	<ul style="list-style-type: none"> • Insufficient detail to determine any study content

As we planned to apply coding procedures to identify BCTs used within the education identified by the literature review, we contacted the corresponding author of each included article by email and invited them to provide additional information on the educational content described within their studies. Specifically, authors were invited to consult any additional resources not included within journal articles (e.g. study protocols, education materials/manuals) and complete an information form detailing which BCTs they had included within the educational context of their studies. However, no additional information was provided by authors beyond that described within journal articles.

Materials

Michie et al's (2011) taxonomy was used as the coding scheme for the present study. It identifies 40 distinct BCTs that are informed by various behaviour change theories (for list of theories see Michie et al., 2005), and provides an accessible and standardised vocabulary that can be used to identify BCTs within research. Other researchers have used this tool similarly for coding intervention content and have demonstrated its suitability for this task (Dombrowski et al., 2012; Michie, Abraham, Whittington, McAteer, & Gupta, 2009; Williams & French, 2011).

Coding procedure and analysis

Coders (AC, JH, AF, SP) familiarised themselves with Michie et al's (2011) taxonomy of theoretically informed BCTs. Coders then independently read through all intervention descriptions and highlighted BCTs within selected articles that were also defined within the taxonomy. BCTs were coded only a) if authors of the articles explicitly referred to content matching taxonomy descriptions, or b) if the BCTs appeared within descriptions of the educational content (and not elsewhere in articles). To identify the exact location of BCTs, coders noted page numbers and associated quotes from within articles as evidence of each technique. This was also used to illustrate how closely the identified BCT matched those described within the taxonomy. Additional comments were also made when ambiguities arose whilst coding. Once coders independently identified BCTs within articles, at least one other coder repeated this process so that all articles were double coded. Analysis consisted of identifying the frequencies of individual BCTs within and across all included articles. Following this, coders met to raise any discrepancies or difficulties that had occurred and all issues were resolved via discussion. The analysis was therefore an iterative process occurring in parallel with the coding. In addition to the main analysis, descriptive information including date of publication, country of study, the study design, and theory informing the intervention was extracted from included articles in order to

describe the sample. Corresponding with the procedures above, two researchers extracted this information independently and then compared their results to ensure reliable coding.

6.4 Results

Systematic review: Identification of relevant articles

A total of seven relevant articles were identified by the systematic review (Bell & Cole, 2008; Luszczynska & Haynes, 2009; Moser & Stagnaro-Green, 2009; Poirier et al., 2004; Rakel & Hedgecock, 2008; Rodríguez & Fornari, 2006; Wylie & Thomson, 2007). A comprehensive narrative synthesis was not conducted as the aim of the present study was to identify BCTs within education content descriptions rather than to assess study quality. However, key descriptive features of articles are summarised in Table 1. Articles were published between 2004 and 2009, five of which (71%) were based in the US, and two (29%) in the UK. One article described a case study in which no outcome data were obtained, three were evaluation only studies in which outcome data were collected, two were before-and-after studies in which baseline and outcome data were obtained, and one was a randomised controlled trial (see Table 2). Of the seven articles, three did not explicitly report any theoretical basis informing their education; the other four articles explicitly reported basing aspects of their education on at least one of the following theories: Stages of Change Model, Health Belief Model, and Social Cognitive Theory (see Table 2).

Table 2. Description of articles (n = 7) included within the systematic literature review including study year, country, design and underlying theory

Paper	Year	Country	Study Design	Named theory informing the education
Bell & Cole	2008	US	Before-and-after	Stages of change
Moser & Stagnaro-Green	2009	US	Evaluation only	Health belief model, social cognitive theory, stages of change
Poirier et al.	2004	US	Before-and-after	Stages of change
Rakel & Hedgecock	2008	US	Evaluation only	None
Rodríguez & Fornari	2006	US	Evaluation only	None
Wylie & Thomson	2007	UK	Case study	Stages of change; health belief model (locus of control also mentioned)
Luszczynska & Haynes	2009	UK	Randomised Controlled Trial	None

Identification of BCTs

Across the seven included research articles, seven different BCTs were described within descriptions of educational content. These were motivational interviewing (MI), general communication skills, information on consequences, stress management, barrier identification, self-monitoring and action planning. Thus 34 of the 40 possible BCTs (which made up the coding framework) were not included within obesity management education for nursing and medical students. There were between one and five different BCTs reported within each article (median = 2). MI and general communication skills were the two most frequently reported BCTs. Figure 1 displays the frequency of individual BCTs included across all research articles. In addition to this, an example of how each BCT was referred to within articles is displayed within Table 3.

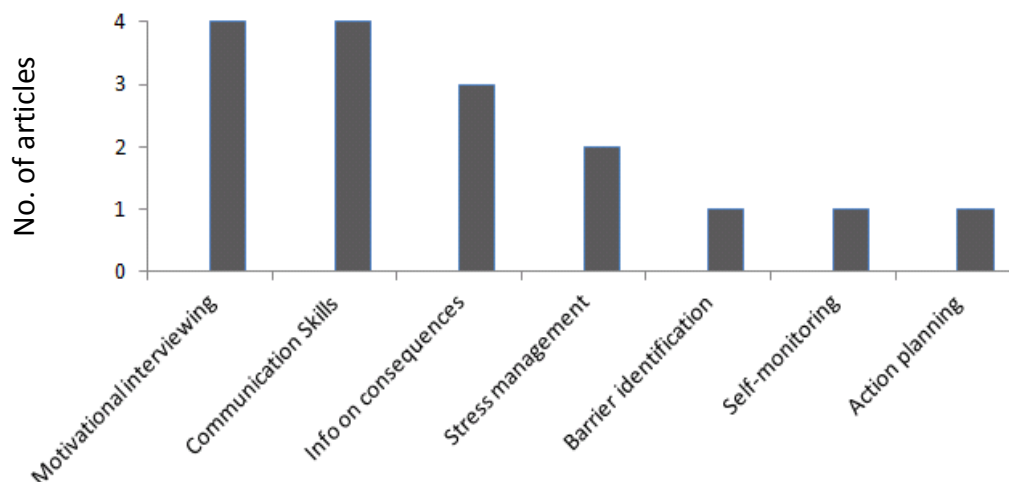


Figure 1. Frequency of behaviour change techniques reported within research articles (n=7)

Table 3. Examples of BCT descriptions within articles included in the systematic review.

BCT label	BCT coding example (extracted from intervention descriptions within articles)	Study from which the example was obtained
Motivational Interviewing	'We chose to build new course around Motivational interviewing'	Bell & Cole (2008)
Communication skills	'Students were taught to differentiate between open-ended and closed questions. Reflective listening was discussed and practiced in the first session'	Poirier et al. (2004)
Information on consequences	'Students discuss the morbidity and mortality caused by risky health behaviours'	Moser & Stagnaro-Green (2009)
Stress management	'Students teach patients to manage their weight through lifestyle changes in nutrition, exercise and stress management'	Rodríguez & Fornari (2006)
Barrier identification	'The Health Belief Model maintains that the likelihood of taking a recommended preventive action depends on multiple factors, including...perceived barriers to taking action, and the threat of disease'	Moser & Stagnaro-Green (2009)
Self-monitoring	'The web tool asks...students to reflect on five ingredients of health: lifestyle choices, nutrition, family history, mind-body influences and spiritual connection...At the module's end, a summary print-out is created of the student's self-written health plan'	Rakel & Hedgecock (2008)
Action planning	'Students were asked to make their own plans about F&V intake and fill out the form: This is my plan about fruit and vegetable consumption for the next seven days. During the next week, I plan to eat ... (please, write down what type and amount of fruit/vegetable you plan to eat) at ... (write down the time of the day) in/at ... (describe the situation/place where you plan to eat your food). If I am tempted to eat something else, I plan to ... (write down, how you plan to deal with temptations)' (also completed for physical activity)	Luszczynska & Haynes (2009)

Notes: BCT = Behaviour change technique; MI = Motivational interviewing; F&V = fruit and vegetable

6.5 Discussion

Summary and interpretations of findings

Results of the initial literature review revealed that few studies ($n = 7$) adequately describe obesity education for medical and nursing students. Research supports that although a number of studies have been conducted in this area, reports often include more detail on describing when and where education was delivered to students, rather than focusing on the educational content itself (Chisholm, Hart, Mann, et al., 2012). This limits the utility of this literature as a whole as replication and evaluation of active educational components is prevented (Abraham & Michie, 2008). This finding further indicates that recommendations to use reporting frameworks such as the CONSORT and TREND statements (Des Jarlais et al., 2004; Moher et al., 2001), have not yet been incorporated consistently within this area of research. Findings also indicate that while some theory-based BCTs have been applied to obesity management education for medical and nursing students, most defined by Michie et al's (2011) taxonomy have not (34 of 40). Our present study findings do not allow us to identify the reasons for this however, a number of possibilities are proposed.

Firstly, authors may be unaware of the range of BCTs defined within the literature. The taxonomy used within this study is a relatively recent development and has already undergone revisions (Abraham & Michie, 2008; Michie et al., 2011). Thus, despite the longstanding acknowledgement of various BCTs, it may be that the development of a standardised BCT vocabulary is necessary to elicit improved levels of reporting transparency and that more time is required for its influence to be observed. Beyond the taxonomy used within the present study, other taxonomies have also been developed which identify an even wider range of techniques and behaviour change competencies health professionals should possess (Dixon & Johnston, 2010; NHS Yorkshire & Humber, 2011).

Further dissemination of BCTs may therefore be required to allow for more extensive applications to obesity education research. Secondly, it may be that there is not enough identifiable evidence to support researchers in selecting individual BCTs for use within behaviour change interventions. Although some recent work has begun to identify effective BCTs within healthy eating and physical activity interventions, such as 'self-monitoring' (Michie, Abraham, Whittington, et al., 2009), 'action planning', 'providing instruction' and 'reinforcing effort towards behaviour' (Williams & French, 2011); for most BCTs a substantial evidence-base does not exist. Therefore, researchers may not only be unaware of the range of BCTs that exist, but they may also select to include the fewer, more widely evidenced techniques.

Finally, it may instead be the case that some BCTs are easier to operationalise than others. It can be argued that the seven BCTs identified within obesity education in this study have substantially more descriptions and examples of use within the literature than some of the other BCTs that weren't included. MI in particular has received substantial attention in the literature with numerous examples of applications to interventions (Britt et al., 2004; Knight, McGowan, Dickens, & Bundy, 2006; Resnicow, Davis, & Rollnick, 2006; Rubak, Sandbæk, Lauritzen, & Christensen, 2005). Research has also highlighted action planning as a simple and effective method of facilitating behaviour change (Sniehotta, 2009). However, this speculation about the relative feasibility of different BCTs is not supported by empirical evidence.

Methodological issues

There were some methodological issues that are important to consider in terms of the results. Firstly, during coding procedures it was observed that authors occasionally described identifiable BCTs within sections of the article other than the education description. For example, Moser and Stagnaro-Green (2009, p. 851) identified 'self-monitoring' as a BCT in the introduction but did not go on to report

including this within their own intervention. This may reflect that although researchers are aware of theory-based BCTs they do not value their use within obesity education or alternatively are not reporting education content adequately within research reports. Secondly, coders observed that authors often used language that was too general to determine specific behaviour change methods or strategies. For example, authors described education for medical/nursing students as including 'behaviour change techniques' (Moser & Stagnaro-Green, 2009, p. 852). In another example, students were described to have taught patients stress management but it remains unclear if stress management featured as an educational element of the intervention (Rodríguez & Fornari, 2006, p. 2). In all the above cases where ambiguity arose, BCTs were not coded. Therefore this study was susceptible to underestimating the amount of BCTs that were present. This further illustrates how this lack of detail within research reports is unhelpful for sufficient replication and evaluation of behaviour change research.

In addition to limitations of the articles included within the present study, a number of procedural issues should also be taken into account when interpreting the present findings. In applying the coding manual to the present sample of articles, we found that some BCT definitions overlapped. In particular, it was problematic to code MI and communication skills independently. This was because descriptions relating explicitly to MI would also on occasion include general communication skills. The taxonomy itself does not indicate clear differences between these two techniques and it was therefore not clear whether they should be coded just as MI alone or as distinct BCTs. This issue is compounded by the fact that the coding manual contains individual BCTs as well as and groups of BCTs. For example, 'MI' and 'stress/time management' are likely to include specific combinations of BCTs, whereas other techniques such as 'self-monitoring' or 'barrier identification' are more specific. This lack of distinction between individual and grouped BCTs may therefore indicate substantial overlap between definitions.

Additionally, some included articles described identifying 'readiness to change' in an individual as if it were a stand alone BCT (e.g. Moser & Stagnaro-Green, 2009), despite it not being included within the coding manual. It was considered however that due to its shared underlying theoretical basis with MI (i.e. the Transtheoretical model of change, Prochaska & DiClemente, 1984), 'readiness to change' could be coded as an instance of MI. Authors of this article however, state that 'readiness to change' corresponds with behaviour change approaches other than MI such as perceived severity / susceptibility to illness (Moser & Stagnaro-Green, 2009, p. 855). Therefore coders agreed it was not warranted to code 'readiness to change' as part of MI in the present study. Similarly, it was an objective of another article to have students distinguish the appropriate counselling strategy for patients in each of Prochaska's and DiClemente's (1984) six stages of change (Bell & Cole, 2008, p. 1504). It is unclear here whether or not assessing and improving readiness to change is included as a BCT or an outcome here. Together these examples suggest that there may be additional behaviour change strategies that could be included within the taxonomy as independent BCTs. However, it is important to note that the efficacy of the underlying theory here has been called into question for example, because its components are very broad and do not provide insight into micro-level factors that influence behaviour change (Armitage, 2000; Bulley, 2007). This highlights a further need to develop an evidence base to assess the efficacy of individual BCTs and their related theories in addition to identifying their application within empirical studies.

Another important issue relates to the fidelity of how BCTs are operationalised within research. Within the articles included in this study, BCTs were sometimes clearly identifiable but were described differently between articles and also described differently from the taxonomy definitions making up the present coding manual. For example, in one article authors reported adapting the core principles of MI (Bell & Cole, 2008, p. 1504 Table 1). It is unclear here what deviations from the BCT occurred and also whether or not this should be coded as an instance of MI as defined by the

taxonomy. It is therefore important that future research reports are transparent about BCT fidelity and highlight deviations from taxonomy definitions. Furthermore, it may be important to identify the extent to which the taxonomy definitions deviate from original definitions of pre-existing BCTs within the literature. For example, MI is known as a complex collection of specific communication techniques (Miller, 1991) which are not explained in sufficient detail to replicate it using the taxonomy alone. Together, the above issues highlight limitations of using the selected BCT taxonomy as a coding manual for identifying BCTs within educational healthcare interventions for professionals. The need for further and continued development of BCT taxonomies has however been identified (Michie et al., 2011) and it is therefore suggested that the above issues are taken into consideration.

Conclusion

To our knowledge, this is the first study to test the utility of Michie et al's (2011) BCT taxonomy within a health professional education context and to demonstrate its utility to assess the inclusion of different types of BCTs within descriptions of obesity education in the literature. Our findings highlight that theory-based BCTs are underused within obesity education for health professionals. Furthermore, a number of methodological issues indicate the need for increased transparency within the literature when reporting research of this kind, and also that current taxonomies of BCTs may benefit from both clarifying definitions of BCTs and considering additional BCTs which may be present within the literature.

Chapter 7: Are medical educators following General Medical Council guidelines on obesity education: If not why not?

Chapter type:	Journal article
Journal:	BMC Medical Education
Submission date:	October 2012
Submission status:	Reviewed and re-submitted following response to reviewers' comments January 2013. Currently under re-review.
Journal article reference:	Chisholm, A. Mann, K., Peters, S. Hart, J. Are medical educators following General Medical Council guidelines on obesity education: If not why not? (<i>under review, BMC Medical Education</i>).
Conference presentation:	Poster presentation. <i>UK Society of Behavioural Medicine</i> , Stirling, Dec 2011.

7.1 Abstract

Background

Although the United Kingdom's (UK's) General Medical Council (GMC) recommends that graduating medical students are competent to discuss obesity and behaviour change with patients, it is difficult to integrate this education into existing curricula, and clinicians report being unprepared to support patients needing obesity management in practice. We therefore aimed to identify factors influencing the integration of obesity management education within medical schools.

Methods

Twenty-seven UK and Irish medical school educators participated in semi-structured interviews. Grounded theory principles informed data collection and analysis. Themes emerging directly from the dataset illustrated key challenges for educators and informed several suggested solutions.

Results

Challenges for educators included: 1) Diverse and opportunistic learning and teaching, 2) Variable support for including obesity education within undergraduate medical programmes, and 3) Student engagement in obesity management education. Findings suggest several practical solutions to these challenges including clarifying recommended educational agendas; improving access to content-specific guidelines; and implementing student engagement strategies.

Conclusions

Students' educational experiences differ due to diverse interpretations of GMC guidelines, educators' perceptions of available support for, and student interest in obesity management education. Findings inform the development of potential solutions to these challenges which may be tested further empirically.

7.2 Background

Obesity contributes to preventable death and disease and, in contrast to other lifestyle factors such as smoking, it is increasing universally (Swinburn et al., 2011). Despite continuous international public health efforts to curb unhealthy lifestyle choices (Centers for Disease Control and Prevention, 2011; Department of Health, 2010c; World Health Organisation, 2008a), obesity is now considered a global epidemic (Swinburn et al., 2011; Treyzon, 2005; Wise, 2011). Its prominence and associations with society's most common chronic diseases (Han, Lawlor, & Kimm, 2010; Katz & Faridi, 2007) have inevitably led to calls for doctors to take a role in helping patients manage weight as an integral part of improving and maintaining health (NICE, 2006; Scottish Intercollegiate Guidelines Network [SIGN], 2012; US Department of Health and Human Services, 2001). The benefits of tackling obesity with patients also include the potential to reduce the associated costs and workload for healthcare systems. For example, estimates indicate that medical costs are 30% higher in obese individuals (Withrow & Alter, 2011) and that one sixth of the US healthcare budget is spent on obesity-related illness (Lenzer, 2010).

Because harmful effects of obesity occur within almost all the body's systems, doctors from many healthcare settings encounter patients who will benefit from losing weight (Katz & Faridi, 2007). However, research highlights that opportunities to discuss obesity with patients are missed (Klein et al., 2010; Ma, Urizar, Alehegn, & Stafford, 2004). The socially sensitive nature of the topic along with not knowing how to help patients lose weight can prevent these conversations from occurring (Chisholm, Hart, Lam, et al., 2012; Jelalian, Boergers, Alday, & Frank, 2003). Evidently there is an important unfulfilled role for medical education in preparing doctors in this area.

Evidence about methods to support individuals to change unhealthy behaviours exists and may address doctors' training needs. The development of various theories outlining key behavioural determinants has resulted in the identification of a range of behaviour change techniques (BCTs) (Dixon & Johnston, 2010; Michie et al., 2011). For example, research suggests that self-monitoring is particularly effective in eliciting increases in individuals' fruit and vegetable intake (Michie, Abraham, Whittington, McAteer, & Gupta, 2009). Other examples of effective behaviour change strategies include creating implementation intentions to achieve goals (Gollwitzer, Sheeran, & Mark, 2006) and motivational interviewing to reduce resistance to change (Rubak, Sandbæk, Lauritzen, & Christensen, 2005). Within empirical studies, patients are shown to lose weight and change dietary and activity patterns when health professionals use these kinds of behaviour change techniques (McTigue et al., 2003; Rubak et al., 2005). Theories such as the PRECEDE-PROCEED model (Green, 1999) and Social Cognitive Theory (Bandura, 1986) can also be particularly helpful for health promotion programme designers because they highlight multi-level factors within individuals' contexts, behaviours and environments that influence the success of behaviour change interventions. Thus a large evidence-base exists from which medical education could draw to inform curriculum developments involving obesity management.

Despite the availability of these theoretical frameworks and recommendations from the UK's General Medical Council (GMC, 2009) that medical students graduate with the ability to discuss obesity and psychological aspects of behaviour change with patients, the extent to which students receive this education is unknown. Some research suggests however, that behaviour change education tends to be sporadic and presented separately from clinical experiences (Moser & Stagnaro-Green, 2009). Surveys indicate that physical activity and smoking education are particularly poorly integrated within undergraduate medical programmes (Garry, Diamond, & Whitley, 2002; Roddy, Rubin, & Britton, 2004). However, it is difficult to clearly identify behaviour change education through descriptive

curriculum surveys (Moser & Stagnaro-Green, 2009) and more in-depth methods may be required to understand the nature of this education within medical school curricula. In relation to obesity, a recent systematic review identified few educational interventions for medical students (none of which were from the UK or Ireland), illustrating that it remains unclear whether medical students are receiving training in this area (Chisholm, Hart, Mann, et al., 2012). Due to insufficient empirical evaluations it also remains unknown what effective obesity management education entails (Chisholm, Hart, Mann, et al., 2012).

It is possible that current medical programmes have integrated effective education in this topic already. However, reported slow uptake and poor integration of other behavioural and social science topics suggest otherwise (Christopher, Harte, & George, 2002; Litva & Peters, 2008). Barriers such as an inability to identify appropriately qualified teaching staff and not formally assessing these topics have prevented sufficient integration within medical education (Litva & Peters, 2008). However, investigations have not focused upon the barriers to providing students with education that specifically focuses on supporting obese patients to lose weight through changing unhealthy behaviours (referred to from here on as obesity management education; OME). This study aimed to identify medical educators' perceptions of the main factors which influence the inclusion and delivery of obesity education within undergraduate medical programmes.

7.3 Methods

Design

We conducted a qualitative study to explore the research question. Rather than administering surveys to gather educational descriptions as similar studies have done (Garry et al., 2002; Roddy et al., 2004), we used semi-structured interviews to elicit participants' views and experiences on the

topic. Interviews allowed for unanticipated ideas to be pursued with participants during data collection so that factors underlying OME implementation and delivery could be explored inductively within the dataset. This method was also adopted over other qualitative data collection methods (e.g. focus groups, or face-to-face interviews) because it was deemed more suitable to discuss participants' views and experiences individually. This was because questioning was anticipated to reveal positive and negative experiences and views by participants, which they may not have found comfortable discussing with individuals from other medical schools. Interviews were also anticipated to require in-depth discussions about intricacies within medical programmes, which may not have been feasible within larger participant groups. Using telephones as opposed to conducting face-to-face interviews are acknowledged to enable cost-effective sampling, access hard to reach individuals, and enhance participants' perceptions of anonymity during the interview (Sturges, & Hanrahan, 2004). Given that the current sampling approach involved inviting time-limited medical educators from across the UK and Ireland, and aimed to allow participants to speak candidly about potentially controversial views and experiences, this method was deemed most appropriate. This study was approved by the University of Manchester Research Ethics Committee 5 (22/12/10).

Participants

A purposive sample of educators currently involved in implementing and/or delivering OME within medical schools was sought to participate in the study. Specifically, the sampling approach focused on identifying educators from one of three main categories: 1) those who delivered obesity management education directly to medical students, 2) those who co-ordinated strands or modules of education which involved obesity management within it, 3) more senior educators who were responsible for leading broad components of the undergraduate programme and who therefore had roles in designing or structuring the implementation of the curriculum. This diversity in the sample was sought so that participants with a wide a range of experiences and views regarding both the

implementation and delivery of OME were included. In line with an exploratory qualitative approach, it was anticipated that this diversity would result in a rich dataset comprising various ideas and issues so that as many different factors relevant to the research question could be identified (Peters, 2010). Individuals potentially meeting these criteria were identified by one researcher (AC) using information available on university websites. Thirty-four medical schools from the UK and Ireland were invited via email through directors of studies and senior staff. We asked individuals (following responses to initial emails) to nominate other educators within their school to participate if they felt they personally did not meet inclusion criteria, so that educators with the most relevant experiences could be recruited. Recruitment therefore followed a complex snowballing procedure in which individuals were contacted on multiple occasions regarding participation and subsequent nominations of other educators. A detailed log book was maintained in order to record up to date information about which educators had been contacted, dates of all correspondence, and details of initial and subsequent contact with additionally nominated educators. This ensured the same individuals were not repeatedly contacted by mistake, and also ensured follow up emails were sent following appropriate time gaps in relation to each individual correspondence string. Subsequently, 46 individuals from the 34 medical schools were invited to participate. In line with qualitative methodological principles (Peters, 2010), this approach also enabled the generation of a varied sample of individuals with different characteristics which increased opportunities to elicit a full range of existing views on the research topic.

Data collection

One author (AC) conducted semi-structured telephone interviews with participants (mean duration = 29 minutes, range = 15-44 minutes). AC initially defined the term 'obesity management'; clarifying that the focus of the interview was on lifestyle management rather than surgical or pharmacological interventions. A topic guide directed questioning around participants' views and experiences of OME

(e.g. satisfaction with quality of education; barriers and facilitators to provision of education).

Participants provided written consent and interviews were digitally audio-recorded and transcribed verbatim.

Data analysis

Data were analysed using grounded theory principles (Strauss & Corbin, 1998). AC initially created an analysis document outlining patterns in the data which were then grouped into potential themes and subthemes. Patterns included any ideas or issues raised or discussed by participants which emerged more than once and were relevant to the research question (i.e. would inform understanding about what factors might influence the delivery or implementation of OME). Any data corresponding to identified patterns were highlighted in the transcript text and then recorded within a separate analysis document to that emerging categories could be seen. These categories were placed into broader themes and sub-themes as further data was collected. The structure of themes and sub-themes was continually evolving as patterns became clearer and relationships between different groups of data were identified. The research team (AC, SP, JH, KM) met on several occasions to discuss how closely super- and subordinate themes related to the data. Five iterations of analysis were conducted and each time the topic guide was amended so that emerging themes could be explored with participants in subsequent interviews. Analysis and data collection ceased when no new ideas arose from interviews and the identified themes and subthemes remained stable despite gathering data from new participants.

7.4 Results

Of the 46 individuals invited, 27 from 23 different medical schools participated. Participants' mean age was 51 years (range 29-65 years), 14 (51.85%) were female, and 24 (88.89%) were British.

Participants' educational roles and specialties/disciplines, and characteristics of medical schools included in the sample are displayed in Tables 1 and 2 (respectively).

Three themes emerged from the data that explained which factors influenced OME implementation and delivery within medical schools: 1) Diverse and opportunistic learning and teaching, 2) Variable support for including OME within undergraduate medical programmes and, 3) Student engagement in the topic (Figure 1). Quotes from interviews are italicised and non-identifying participant codes provided in parentheses with references to individuals' educational roles (e.g. Pt1: D). Table 1 displays definitions of educator role labels.

Table 1. Interview study participants' (n=27) roles within UK and Irish medical schools and their occupational specialties/disciplines

	Frequency of participants (%)
<u>Educational role within medical school*</u>	
Delivers education [D]	6 (22.22)
Co-ordinates module/strand [C]	11 (40.74)
Leads undergraduate programme [L]	10 (37.04)
<u>Clinical or academic specialty/discipline</u>	
Clinical (including Rheumatology, Podiatry, Anaesthesiology , Midwifery)	5 (18.52)
General Practice (General Practitioners)	8 (29.63)
Behavioural Sciences and Education (Cognitive/Clinical/Health Psychology, Medical Education)	6 (22.22)
Public Health (Dietician, Epidemiology, Public Health Medicine/Research)	3 (11.11)
Biomedical Sciences (Biochemistry, Pharmacology, Immunology)	5 (18.52)

**D = Educators who deliver a distinct component of the curriculum that relates explicitly to obesity (and who do not have any broader roles within the medical school)*

C = Educators who co-ordinate relevant modules or strands in the medical programme (may therefore deliver as well but main role to coordinate a relevant section of the curriculum).

L = Educators with a broad overview of the curriculum (may deliver distinct components as well) e.g. deans, course developers, directors of studies.

Table 2. Characteristics of UK and Irish medical schools (n=23) included within the interview sample

Characteristic of medical school	Number of medical schools (%)
Time period established	
1400-1899	11 (47.83)
1900-1999	7 (30.43)
2000-present	5 (21.74)
Entry level for course	
School leavers only	8 (34.78)
Graduates only	1 (4.35)
Both school leavers and graduates	14 (60.87)
Intake per year	
1-150	7 (30.43)
151-300	8 (34.78)
301-450	8 (34.78)
Medical school course description*	
Predominantly didactic	10 (43.49)
Predominantly PBL	5 (21.74)
Hybrid PBL/didactic	8 (34.78)

* Classifications of Medical school curriculum type were derived from the most recently published GMC QUABME documents (http://www.gmc-uk.org/education/medical_school_reports_full_list.asp) or where this information was not available, course description on University websites were used.

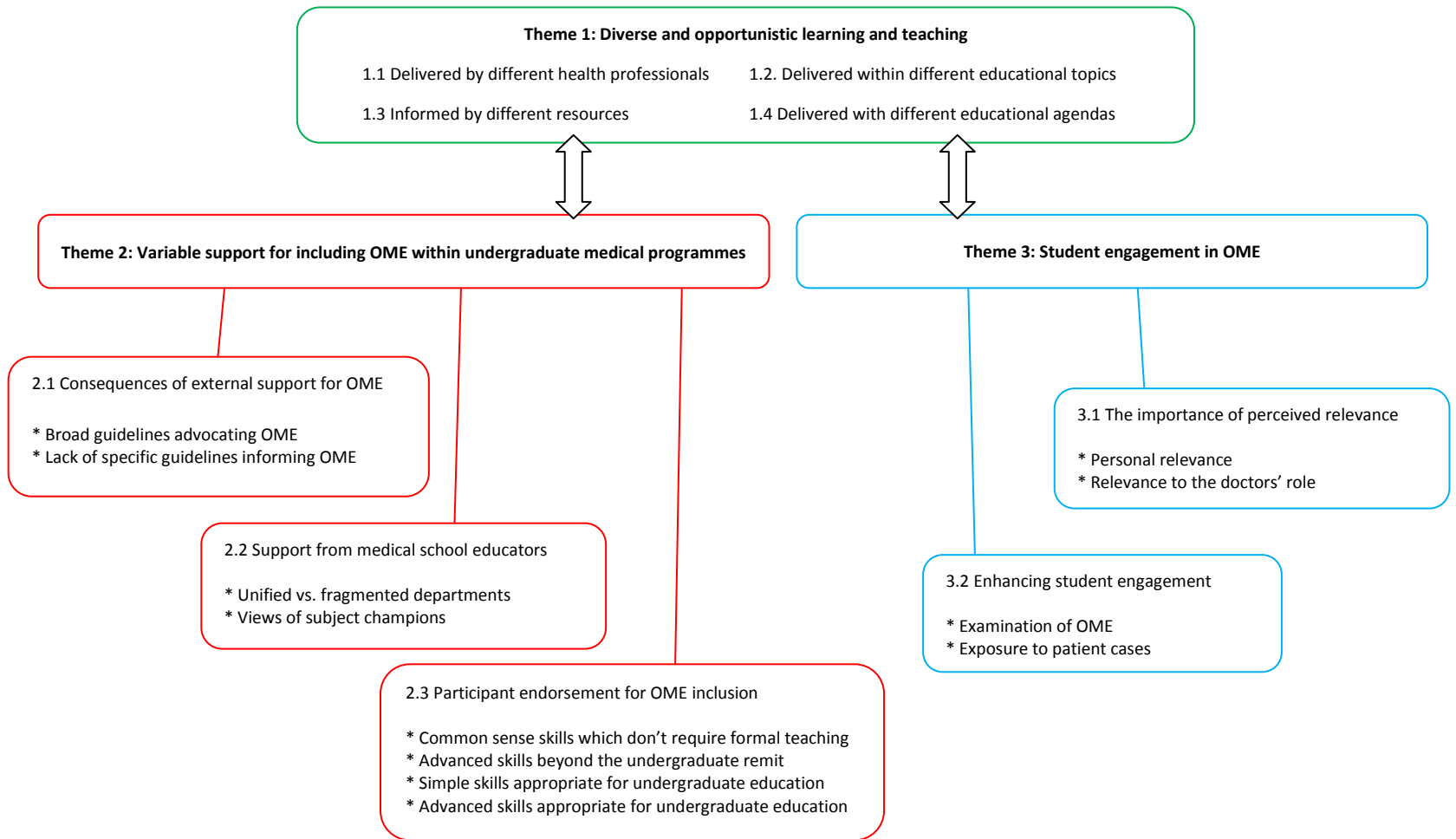


Figure1. Themes and subthemes explaining the challenges of implementing and delivering OME and suggested solutions

Theme 1: Diverse and opportunistic learning and teaching

Participants described a diverse range of educational approaches to providing OME (Table 3). Firstly, various health professionals were reported to deliver the education including doctors, other health professionals and public health professionals/researchers. Secondly, participants highlighted that OME could *'could fit anywhere'* (Pt7: L) within medical programmes and reported a range of topics in which it occurred. These factors were believed to lead to variability in students' experiences of OME. The opportunistic nature of clinical placements in particular was thought to account for the omission of this education for some students.

'We would expect a number of obese people to come into consultations and for the GPs to opportunistically teach on the subject, I couldn't put my hand on my heart and say yes every student gets taught about obesity' (Pt22: C)

Participants also reported using different resources to inform OME content and working towards contrasting educational agendas (see Table 3). Most strikingly, whilst some OME aimed to raise student awareness about issues related to obesity, others provided students with skills to support patients to change obesity-related behaviours.

'You said you were quite interested in lifestyle management stuff and I don't know that we do go very far down that road really so it's more kind of flagging up obesity as an issue and showing why it's important' (Pt8: C)

'If we're teaching them that it is an important thing to do it can be sending quite a dissonant message if then we said it's important but don't worry about it - learn it one day..we expect our 5th year students who do a...placement in general practice to actually achieve some behavioural change with patients' (Pt16: L)

Table 3. Participants' (n=27) descriptions of how obesity management education is provided to students within medical schools

Delivered by different health professionals	Delivered within different educational topics	Informed by different types of resources	Delivered with different educational agendas
1. Audiologist 2. Bariatric surgery researcher 3. Biochemist 4. Biomedical scientist 5. Children's health advocacy organisation worker 6. Clinicians (various specialties) 7. Communication skills specialist 8. Dietician 9. Psychologist 10. Midwife 11. Nurse 12. Nutritionist 13. Pharmacist 14. Physiotherapist 15. Public health professional 15. Social worker 16. Speech and language therapist	1. Adherence behaviour 2. Central nervous system 3. Chronic disease 4. Clinical placements 5. Communication skills 6. Endocrinology 7. Gastroenterology 8. Human diversity 9. Lifestyle 10. Metabolism 11. Nutrition 12. Obesity week 13. Patient safety 14. Professionalism 15. Psychiatry 16. Psychology 17. Rheumatology 18. Surgery	1. Behavioural and social sciences literature and education network guidelines 2. Charitable organisation resources (national forums for health/obesity) 3. Government guidelines (Department of Health reports/handbooks) 4. Healthcare system guidelines (NICE/SIGN) 5. Personal experience (from clinical practice)	<u>To raise awareness of:</u> 1. Consequences of unhealthy behaviours 2. Current practice and team work 3. Determinants of obesity 4. Difficulties of achieving behaviour change 5. Effective behaviour change techniques 6. Epidemiology of obesity 7. Importance of biopsychosocial approach 8. Health promotion approaches 9. Public health issues related to obesity <u>Skills acquisition:</u> 10. Address patients' beliefs/barriers to change 11. Assess patients' self-efficacy 12. Constructive advice regarding weight loss 13. Learn/use behaviour change skills 14. Practical management of obesity with patients

Note. The content of each column represents concepts derived directly from participants' expressions within the dataset.

Theme 2: Variable support for including OME within undergraduate medical programmes

2.1 Consequences of current external support for OME

Participants reported the positive influence of broad curriculum guidelines, particularly Tomorrow's Doctors [TD](GMC, 2009) in endorsing the inclusion of OME within curricula.

'It [TDs] was kind of fuel to the fire of, I think we need to do something and we need to be to be highlighting this but it certainly contributed, it provided support for me saying to my colleagues I think we need this in' (Pt15: C)

Although educators did not believe that TDs *'should be too prescriptive'* (Pt7: L) they reported a lack of supplementary guidance for developing education in this area. This was compounded by the fact that educators felt they themselves lacked understanding about what methods effectively support obese patients to change unhealthy behaviours. This was thought to explain why there was more education on other lifestyle behaviours perceived to be easier topics to approach.

'Obesity is probably fairly lightly touched upon amongst other issues like smoking...we still struggle as clinicians in our conversations with obese patients. Even just raising the topic is more difficult than smoking. If me on my clinical days I struggle with it in the practice down the road, then it's not surprising if perhaps I struggle how to teach it to medical students' (Pt22: C)

2.2 Support from medical school educators

Support internal to medical schools varied: some participants described *unified* medical school departments where support for OME was unequivocal, whereas others described *fragmented* departments in which there was disagreement among educators about how important OME was and in what discipline it fit.

'I don't know that necessarily everybody thinks it's terribly important...people tend to say "oh behavioural and social sciences" you know, and kind of wave their hand over there somewhere; [we] tend to be seen as a little cluster somewhere over there and-slightly interchangeable' (Pt8: C)

Participants reported achieving successful implementation of OME due to the influence of key figures who could advocate for medical education and influence its implementation: *'you need a few*

champions to take it on board' (Pt6: D). Participants were therefore disappointed if potential advocates missed opportunities to aid implementation.

'I am disappointed that deans haven't done more and including head of school...it's a big gap in our teaching...They've been supportive in terms of words but they haven't really put any pressure on the students to attend or any direct encouragement...they are giving a clear message about aspects of the curriculum which they think are vital' (Pt27: C)

In contrast however, some participants described subject champions as individuals who inappropriately push topics into the curriculum due to personal interest.

'It almost became a crusade for various people...it is certainly made into a priority by various people who are in the system; not everything is based on identifiable patient needs, our medical student needs, some of it is driven by professionals with an interest in that field' (Pt2: C)

2.3 Participant endorsement

Participants supported the inclusion of OME within medical programmes for two reasons; 1) obesity contributes to prominent chronic diseases, and 2) doctors' responsibilities include managing obesity with patients. Despite this, participants displayed contradictory perceptions around how advanced OM skills are in practice. Some believed obesity management is 'common-sense', which doesn't require training.

'Not everything needs to be taught in a direct [way], a lot of these things are common sense ... if they know the basics of biochemistry, if they know the basics of human nutrition, the basics of human physiology, they know the basic medicine surgery that kind of stuff this kind of issue, they should be able to handle it very effectively' (Pt2: C)

In contrast, others argued that OME involves advanced skills beyond the scope of undergraduate education.

'They're [medical students] not yet ready to be practicing these things...I think further down the line when they start to specialise' (Pt18: D)

Some participants believed OM involves skills that can and should be included within undergraduate medical programmes. Within this group of participants though, disagreement existed regarding whether OM skills were basic or difficult for undergraduate students to master.

'We're stopping short if we don't teach about those sorts of basic approaches to behavioural change and they are very basic so it's not, we're not teaching complicated processes but we're teaching basic approaches like motivational interviewing' (Pt16: L)

Theme 3: Student engagement in the topic

Whilst some educators reported that students were very engaged in learning about OM, others found it difficult to elicit student interest in the topic.

3.1 The importance of perceived relevance

The extent to which the issue of obesity was relevant to students was reported to affect engagement levels. Firstly, the personal relevance of obesity to students was believed to help or hinder student engagement in OME.

'There needs to be a way to make them interested...they're all thin because they do lots of sports and they can't relate it in their personal lives' (Pt6: D)

'I have had individual students who are really enthusiastic about obesity and obesity management, interestingly some of whom have obesity problems themselves' (Pt1: D)

Secondly, unlike study participants themselves (as illustrated above), it was reported that students often did not perceive OM as being within the doctor's role and were therefore more interested in learning about biomedical aspects of medicine than topics related to obesity management.

'They believe it's just somebody else's role, their role is more sort of dealing with organic damage or more obvious manifestations of disease and illness rather than dealing with consequences' (Pt1: D)

3.2 Enhancing student engagement

Because of the perceived relationship between level of student engagement in OME and how relevant they consider the topic, educators attempted to enhance student engagement by actively highlighting its relevance within educational sessions. In particular, patient cases (real or simulated) that explicitly involved obesity were used to achieve this. An additional strategy to enhance student engagement was implementing formal assessments as this communicated that OME was a priority within their undergraduate programmes.

'That's absolutely crucial they've got to think two things either oh god are they ever going to need this as a doctor or b) will they be examined on it. So we also put exam questions in and we make that clear' (Pt6: D)

Implications of the themes for potential solutions to address educators' challenges

We suggest a number of practical solutions to the challenges highlighted by the study findings (see Figure 2). Firstly, in order to guide educators in selecting educational approaches which coincide with curriculum recommendations (GMC, 2009) and reduce variability in student experience, we suggest that a statement detailing the core objectives of OME be produced to complement the GMC's competency requirements for including it within undergraduate programmes. It may be beneficial for the statement to specify particular competencies students are expected to accomplish and identify key components of consultations involving obesity management. For example, 'students will demonstrate the ability to 1) raise the topic of obesity management with patients 2) include effective behaviour change techniques within discussions of obesity management with patients 3) refer patients to appropriate services and resources.' This level of specificity could assist educators in ensuring all students are exposed to key elements of OME and help them meet GMC recommendations without placing inflexible restrictions upon how it is provided.

Theme 2 illustrated that educators felt unsupported in selecting optimal educational content for OME. We therefore propose that educators are provided with content-specific guidelines on obesity management, particularly as there is available evidence-based literature outlining behaviour change techniques suitable for use by health professionals (Dixon & Johnston, 2010; NHS Yorkshire and Humber, 2011). This should improve educators' awareness of the skills involved in supporting patients with managing obesity and thus provide better support for them in selecting content for medical programmes. In addition, this could also address issues identified within theme 2 regarding confusion around the complexity of behaviour change skills and therefore how suited they are to being included at the undergraduate level. By making behaviour change skills more transparent to educators, and demonstrating that they can be implemented within clinical interactions (McTigue et

al., 2003; Rubak et al., 2005), conflicting perceptions between educators about the level of difficulty involved in learning obesity management skills may be reduced.

Finally, theme 3 illustrated diversity in educators' experiences of engaging students in learning about obesity management. Educators consistently emphasised the importance of creating education that feels relevant to students to stimulate motivated learners. Although the association between relevance and student engagement has been highlighted previously (Bundy et al., 2010), it seems that a more consistent approach to designing OME that is directly relevant to medical students is needed. Based on the above findings, we propose that educators ensure OME is tailored to highlight its relevance to students both professionally and personally; for example by including real patient cases (to demonstrate its relevance to the doctor's role) and explicit assessments within medical programmes (to demonstrate its relevance to students as learners).

Theme 1 – Diverse and opportunistic learning and teaching of obesity management education (OME)

The problem: The type and extent of OME delivered to medical students varies widely, indicating that GMC recommendations are interpreted differently and that training for future doctors is inconsistent.

Suggested solution: Dissemination of a clear statement detailing broad educational objectives in relation to OME. For example, 'Students will demonstrate the ability to 1) raise the topic of obesity management with patients 2) include effective behaviour change techniques within discussions of obesity management with patients 3) refer patients to appropriate services and resources.'

Theme 2 - Existing support for including OME within undergraduate medical programmes

The Problem: External guidance for educators designing OME is lacking and there is mixed support for the inclusion of OME within medical schools.

Suggested solution: Increase access to evidence-based, content-specific guidelines and within this, include effective behaviour change techniques to improve awareness of the skills involved in supporting patients with managing obesity and demonstrate its suitability for inclusion at the undergraduate level.

Theme 3 - Student engagement in OME

The problem: Whilst some educators experience students who are interested in learning about obesity management, others encounter difficulty engaging students.

Suggested solution: Implement recommendations to enhance student engagement in learning about obesity management through tailoring education to highlight its relevance to students as future doctors and by including real patient cases where possible and including explicit assessment on OME.

Figure 2. Problems associated with OME based upon interview study findings and suggested solutions

7.5 Discussion

This study demonstrates that inconsistency within UK and Irish OME derives from a lack of clarity and consensus about how to design and deliver this education. Previous research has identified the challenges of integrating comparable lifestyle-related topics such as smoking and physical activity within medical programmes (Garry et al., 2002; Litva & Peters, 2008; Roddy et al., 2004). Thus this study suggests that barriers to curricular integration remain, even for high priority, topical issues like obesity (Wise, 2011). We therefore offered some practical suggestions for moving forward. We have also drawn from a broad sample of medical educators in order to better understand these issues including the lack of clarity regarding who is best placed to deliver OME and where it should be located within medical programmes. A key finding within our study was that educators believed that the opportunistic and multi-disciplinary nature of obesity management largely accounted for inconsistent student experiences. A notable consequence of this is that some students may receive no formal education in this area at all, suggesting a failure to meet GMC recommendations that all medical graduates should be able to discuss obesity and behaviour change with patients (GMC, 2009).

Another key finding reported by educators was that OME can be delivered within numerous areas of the curriculum. Although this may assist with integrating OME within existing programmes without adding to the pressures of already overloaded curricula (Hussain, 2012; Sefton, 2004), it may also reflect a lack of understanding about how to deliver optimal OME. Although this is understandable given the lack of available evidence on this (Chisholm, Hart, Mann, et al., 2012), guidelines on designing and integrating medical education in this domain have recently been developed and may be helpful for educators (Bundy et al., 2010). Our findings also identified disparity between the reported educational agendas that guided OME objectives; some focused upon raising student awareness about obesity whereas others aimed to equip students with weight management skills. This suggests that GMC recommendations on this topic (GMC, 2009) have been interpreted differently and that

competency levels expected of students in this area may vary considerably across medical schools. Thus it may be beneficial for future recommendations to specify some common OME objectives to clarify the competencies medical students are expected to achieve (Figure 2).

Participants' views of current resources for developing OME revealed a tension between the useful influence of curriculum guidelines (GMC, 2009) in advocating its inclusion within curricula, and the lack of supplementary guidance to inform educational content. Although educators wanted specific guidance on how to teach OME, there is a paucity of evidence to inform these educational decisions (Chisholm, Hart, Mann, et al., 2012). There is however, a large evidence-base which has defined theory-informed behaviour change techniques (Dixon & Johnston, 2010; Michie et al., 2011); which have produced some desirable changes to health behaviours and health outcomes (Michie, Abraham, Whittington, et al., 2009; Olson, Gaffney, Lee, & Starr, 2008; Pollak et al., 2010; Rubak et al., 2005). Better application of this literature to medical education is therefore required and could address this challenge for educators.

We identified conflicting accounts regarding support within medical schools. Whilst some viewed educators involved in providing OME as valuable subject champions, others believed they created unhelpful interest groups. Participants expressed other contradictory views about how complex OM skills are and how appropriate it therefore is to provide this education to medical students. We could not determine the impact of these contrasting views upon student experiences; however, the role of the hidden curriculum (i.e. implicit influences within institutions) in preventing successful curriculum reform has been identified previously (Hafferty, 1998; Lempp & Seale, 2004). Research in this area suggests that implicit beliefs and attitudes of educators can influence students' learning and future career choices (Gofton & Regehr, 2006). Thus it may be that the views of educators reported in our study affect the provision of OME within medical schools and the likelihood of students addressing

this issue with future patients. We therefore advocate the dissemination of content-specific guidelines within medical schools which would alert educators to the evidence-base for effective behaviour change techniques and demonstrate that skills teaching in this area is suitable at the undergraduate level. This may in turn promote more consistent support for its inclusion within undergraduate programmes.

Although the GMC advocates including OME within medical programmes and their recommendations are highly valued by medical schools (Rubin & Franchi-Christopher, 2002), evidence also shows that due to various barriers, the implementation of topics related to public health has been slower than others (Christopher et al., 2002; Litva & Peters, 2008). One factor suggested to influence the slow uptake of health promotion education is poor student engagement (Christopher et al., 2002). We heard contrasting accounts of how engaged students were in OME, but participants agreed that enhancing relevance to students was key to improving engagement in the topic. Confusion about doctors' roles in encouraging lifestyle change in patients is continuously reported by clinicians (Bruce & Burnett, 1991; Chisholm, Hart, Lam, et al., 2012), suggesting that clarification on this issue by healthcare governing bodies is needed to resolve some of the issues raised in this study. Additionally, participants in our study and educators in others (Dornan et al., 2006) have indicated that exposing students to experiences in clinical settings can help in improving student engagement in the topic and in clarifying the doctors' role in OM.

Finally, along with these recommendations for individuals involved in implementing OME, it is also important to recognise the role of wider contextual issues. For example, in order to support the successful translation of the above recommendations, attention should also be given to cultivating a supportive environment within medical schools. In line with research highlighting that unsupportive environments can prevent effective education delivery (Litva & Peters, 2008), it may be beneficial to

also consider institutional level interventions which address educators' views and attitudes across medical schools towards changing aspects of curricula and including topics such as OME. Taken together, these findings highlight some uncertainty regarding how medical education is designed and developed. For example, it is unclear how pressing public health issues such as obesity should influence curriculum content; whether educators should be reactive or pro-active about this; and also who is responsible for making these decisions about the evolving nature of medical curricula. Although the present study has not investigated or addressed these issues, it does expose key ambiguities around this topic. Resolving some of this ambiguity may in turn support the production of more consistent and pragmatic education for students.

As obesity is relevant to many areas of medicine, and therefore medical education, it is likely that we did not elicit accounts from individuals across all contexts involving OME. Comparable education in communication skills and behavioural and social sciences have also encountered problems in identifying what, where and how this education is delivered within medical programmes (Brown & Bylund, 2008; Litva & Peters, 2008). This is supported by participants' reports that it was difficult to accurately locate OME within medical programmes and that they may have been unaware of other educators who deliver OME elsewhere in the programme. Although the range of educators in our sample (Table 1) suggest that the findings draw upon a variety of contexts, it is possible that our results were influenced by having larger proportions of general practitioners and psychologists than other health professionals within the sample. It was also not possible to obtain views from educators delivering informal education to students within programmes, despite participants' reporting that this likely made up a substantial proportion of teaching on OME. These limitations themselves support the finding that OME is inconsistently delivered within medical programmes.

A further limitation is that the range of views elicited may have been restricted by recruiting individuals who support OME within medical programmes. Additional barriers may exist for educators with more negative views about OME and we might expect such views to indicate personal barriers (e.g. attitudes about OME) rather than some of the external barriers identified within our study (e.g. lack of resources). However the potential for bias in this way was reduced by the inclusion of accounts from educators with different opinions about the extent to which OME should be included within medical schools. The use of telephones to conduct interviews can also be seen as a strength in that it assisted sampling across the UK and Ireland as well as reducing the likelihood that the researchers' or participants' identity may influence the elicited responses (Sturges, & Hanrahan, 2004). The varied responses and contradictions identified within the results may provide an indication that this was in fact helpful in this way. On the other hand, use of telephones may have also reduced the ability for the interviews to be conducted within optimal settings (e.g. quiet, not interrupted), although there were no indications during data collection to suggest this resulted in any data which was lost or reduced in terms of its quality. Finally, although this study allowed us to suggest means of addressing the challenges identified within the findings, further research is needed to explore the feasibility and efficacy of these potential solutions.

Conclusions

Our study explained the discordance between recommendations by governing bodies to develop doctors who are proficient in supporting patients to change unhealthy behaviours (GMC, 2009; NICE, 2006, 2007; World Health Organisation, 2002) and parallel evidence indicating that doctors feel underprepared by medical education to do this (Chisholm, Hart, Lam, et al., 2012; Jelalian et al., 2003). The current findings highlight that the challenges associated with integrating OME and remain unresolved within UK and Irish medical schools. Potential areas of intervention to address this include: reducing uncertainty around what optimal methods of providing OME involve through defining core

educational objectives; improving external and internal levels of support for OME via dissemination of evidence-based context-specific guidelines to educators; and improving engagement by enhancing the relevance of OME to students.

Abbreviations

UK, United Kingdom; GMC, General Medical Council; OME, Obesity Management Education; TD, Tomorrow's Doctors; OM, obesity management.

Competing interests

The author(s) declare that they have no competing interests

Authors' contributions

All authors conceived the study and contributed to its design. Recruitment was facilitated by all authors and operationalised by AC. AC carried out the data collection and initial analysis. JH, SP, and KM contributed to further analysis. All authors contributed to writing the manuscript and commented on multiple drafts. All authors read and approved the final manuscript.

Authors' information

AC is a PhD student at the School of Psychological Sciences, Faculty of Medical and Human Sciences, University of Manchester UK. KM is Professor Emeritus in the Division of Medical Education at Dalhousie University in Halifax, Canada, and Professor and Part-time Chair in Medical Education, Manchester Medical School in Manchester, United Kingdom. SP is Senior Lecturer at the School of Psychological Sciences, Faculty of Medical and Human Sciences, University of Manchester UK. JH is a senior lecturer in communication at Manchester Medical School, University of Manchester.

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Section two summary

This section has identified that there are few robust empirical evaluations of obesity management education for medical students and subsequently no evidence-base to indicate how best to prepare future doctors for this task. The findings also indicate that health behaviour theories are infrequently reported within these educational interventions and further, that descriptions of this type of medical education rarely include specific behaviour change techniques. This corresponds with findings from the qualitative study in Chapter 7 which shows that educators feel there is little guidance on what to teach medical students in this area. Other challenges to integrating obesity management education into undergraduate medical programmes were related to the diversity and opportunistic approach to delivering this education, varied support for its integration, and varied student engagement. Although this section has highlighted gaps in this literature and barriers to obesity management education, it has also identified potential solutions to these challenges and provides a strong rationale for developing educational interventions in this area.

SECTION THREE: INTERVENTION DESIGN AND EVALUATION

Section three introduction

This section focuses on designing obesity management education and developing an educational intervention for medical students. It comprises two journal articles and one thesis sub-section. The first journal article (Chapter 8) focuses on transferring the evidence-base on behaviour change techniques to a usable clinical communication tool. This study illustrates how behaviour change techniques can be selected from the literature and transformed into such a tool for use by medical students. The second journal article (Chapter 9) describes a feasibility study in which obesity management education is delivered to medical students and evaluated as an educational intervention. Chapter 10 (thesis sub-section) expands on the research processes involved in doing this. It provides a reflection on how the study was designed and conducted and illustrates some of the challenges that were faced in doing this.

**Chapter 8: Development of a behavior change communication tool for medical students: The ‘Tent
Pegs’ booklet**

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Conference presentation:	Work in Progress Poster. <i>Division of Health Psychology</i> , Liverpool, Sept 2012.

8.1 Abstract

Objective

To describe the development and validation of a behavior change communication tool for medical students.

Methods

Behavior change techniques (BCTs) were identified within the literature and used to inform a communication tool to support medical students in discussing health-related behavior change with patients. BCTs were organized into an accessible format for medical students (the 'Tent Pegs' booklet) and validated using discriminant content validity methods with 11 expert judges.

Results

One-sample t-tests showed that judges reliably mapped BCTs onto six of the seven Tent Pegs domains (confidence rating means ranged from 4.0 to 5.1 out of 10, all $p \leq 0.002$). Only BCTs within the 'empowering people to change' domain were not significantly different from the value zero (mean confidence rating = 1.2, $p > 0.05$); these BCTs were most frequently allocated to the 'addressing thoughts and emotions' domain instead.

Conclusion

BCTs within the Tent Pegs booklet are reliably allocated to corresponding behavior change domains with the exception of those within the 'empowering people to change' domain.

Practice implications

The existing evidence base on BCTs can be used to directly inform development of a communication tool to support medical students facilitate health behavior change with patients.

8.2 Introduction

Today's leading causes of premature death are accounted for by lifestyle-related illnesses such as ischemic heart disease, cerebrovascular diseases and cancers (World Health Organisation, 2008a, 2008b). Because these illnesses are largely governed by human behaviors including smoking, alcohol consumption and diet and physical activity patterns, behavioral modification can result in disease reduction and improved health (Lisspers et al., 2005; Steyn, Lambert, & Tabana, 2009; World Health Organisation, 2008a). Thus, a key role of research has been to identify effective methods to support individuals in making changes to these behaviors. At the forefront of this work is the development of a standardized vocabulary of behavior change techniques (BCTs) (Dixon & Johnston, 2010; Michie et al., 2011), many of which are congruent with established theoretical frameworks (Abraham & Michie, 2008; Michie, Johnston, Francis, Hardeman, & Eccles, 2008). One example of this is motivational interviewing, which is a communication approach for exploring and resolving ambivalence about behavior change, and is based upon the core principles of the transtheoretical stages of change model (Miller & Rollnick, 1991; Prochaska & DiClemente, 1984). The clarification of these BCTs has been important because intervention reports have often described techniques differently (e.g. describing different approaches to goal setting, and varied delivery of motivational interviewing), and lacked transparency (e.g. vague reports that 'behavioral counseling' was delivered). These issues have in turn prevented replication or comparative evaluations of behavior change interventions (Abraham & Michie, 2008). With standardized definitions of BCTs however, these issues can be resolved and identification of active components within behavior change interventions improved (Michie et al., 2011).

An emerging evidence base has indicated BCTs which may be more or less effective within different contexts and for different health behaviors. For example, self-monitoring techniques which involve the individual recording their own behavioral performance, have been identified as particularly

effective in eliciting changes in healthy eating and physical activity (Michie, Abraham, Whittington, McAteer, & Gupta, 2009). There is also evidence that training in motivational interviewing (MI) improves the behavior change communication skills of health professionals (Lozano et al., 2010), and that using MI within clinical interactions can encourage patient behavior change particularly in alcohol consumption (Britt, Hudson, & Blampied, 2004) and substance abuse (Dunn, Deroo, & Rivara, 2001). However, further evidence for the efficacy of motivational interviewing is constrained by lack of robust methodology and transparent reports of intervention protocols (Knight, McGowan, Dickens, & Bundy, 2006). This developing evidence base provides early indications of which techniques may be most useful in facilitating change in various health behaviors. In addition, some evidence suggests that behavior change interventions that are explicitly based upon theory are more effective than atheoretical interventions, most likely because they target salient behavioral determinants (Dombrowski et al., 2012; Michie & Johnston, 2012; Taylor, Conner, & Lawton, 2012). It is therefore unsurprising that less effective techniques have been shown to include more generic approaches such as offering financial incentives (Cahill & Perera, 2008; Jepson et al., 2000; Paul-Ebhohimhen & Avenell, 2008) and using scare tactics (Leventhal, 1971). This evidence highlights the importance of tailoring behavior change interventions and encouraging individuals who design and deliver behavior change interventions (e.g. psychologists / health professionals) to select techniques which target salient behavioral determinants for individuals whose health would benefit from making lifestyle changes such as losing weight, reducing alcohol consumption or stopping smoking.

Health professionals have been identified as having a key role in facilitating health behavior change with patients; hence many interventions have been implemented within clinical settings. For example, goal setting techniques are frequently included within primary care interventions (Bodenheimer & Handley, 2009), and recent work has encouraged doctors to capitalize upon 'teachable moments' which refer to time periods in which patients may be particularly susceptible to health behavior

change counseling (e.g. following a myocardial infarction) (Cohen, Clark, Lawson, Casucci, & Flocke, 2011; Flocke et al., 2012). Furthermore, the National Institute of Clinical Excellence (NICE, 2007) expects medical professionals to deliver tailored behavior change interventions to patients within routine practice. Despite this role for medical professionals, doctors often miss opportunities to discuss behavior change with patients (Haynes & Cook, 2009; Klein et al., 2010; Ma, Urizar, Alehegn, & Stafford, 2004). They also report low confidence in this area and a need for education to provide them with behavior change facilitation skills (Chisholm, Hart, Lam, et al., 2012).

The UK's General Medical Council (GMC) has recommended that doctors learn how to communicate with patients about obesity and behavior change during medical school (GMC, 2009). Medical school may be a particularly opportune time to deliver such education as this is when core skills for practice are initially introduced and it may impact upon the quality of care provided to patients in the future (Kalet et al., 2010). Education at this stage may also prevent the development of attitudes that behavior change is a low priority, low relevance topic, which evidence suggests can be conveyed within the hidden curriculum for topics within the behavioral and social sciences (Litva & Peters, 2008). Thus early education for medical students about behavior change facilitation may help to address an educational need for future doctors, and address issues with confidence and attitudes around engaging in behavior change talk with patients.

Despite this, recent evidence shows that educational interventions of this kind are lacking, specifically in relation to obesity management education (Chisholm, Hart, Mann, et al., 2012). Other research has highlighted that behavior change education is inadequate as it is infrequently delivered within medical schools and often presented to students as isolated from clinical contexts (Moser & Stagnaro-Green, 2009). Furthermore, it is unknown to what extent standardized BCTs such as those in the CALO-RE taxonomy (Michie, et al., 2011), and Health Behavior Change Competency (HBCC)

framework (Dixon & Johnston, 2010), have been applied to medical education. In order to contribute to this research area, we argue that behavior change education for medical students that is based upon the existing evidence base needs to be designed and validated. This would firstly enable medical education curricula to incorporate teaching and learning materials that are appropriate for *medical students*. Secondly, evaluations of this education could be conducted to investigate whether or not the behavior change literature can be successfully translated to effective medical education. We therefore aimed to address the first stage of this process, and to create and validate a communication tool applying the available evidence on BCTs to medical education, in an accessible and usable tool for medical students.

8.3 Methods

8.3.1 Communication tool design procedure

The authors used two known taxonomies of BCTs to form the basis of the communication tool. The CALO-RE taxonomy (Michie et al., 2011) has been developed in response to a need for a standardized vocabulary of BCTs used within interventions, and many of its techniques have been linked with established theories of health behavior (Abraham & Michie, 2008; Michie et al., 2008). The HBCC (Dixon & Johnston, 2010) initially outlines behavior change competencies for health professionals who deliver behavior change interventions, and then describes BCTs for use within interventions. As with the CALO-RE taxonomy, HBCC authors note that these BCTs are congruent with numerous motivation-, action-, and prompt/cue-focused health behavior models. These two taxonomies identify 126 BCTs in total. We initially organized these BCTs into overarching categories. These included: providing information, goal pursuit, overcoming barriers, behavioral reinforcement, behavioral performance, monitoring behavior change, providing instruction, social influences,

emotional influences, cognitive influences, environmental influences, and empowerment. In order to select BCTs that were relevant to the study's context (i.e. a practical communication tool for use by medical students), a number of criteria were applied. Firstly, BCTs had to be suitable for use within doctor-patient interactions. Thus they needed to be deliverable via *communication* within healthcare settings. Secondly, it was required that BCTs were associated with sufficient evidence supporting their efficacy. As accumulating evidence for the effectiveness of individual BCTs is not yet conclusive (Michie & Johnston, 2012), we conducted a comprehensive but not systematic review of the literature on health behavior change facilitation. This allowed us to formulate an overview of the evidence for and against BCTs to guide judgments regarding which would be included. Thirdly, duplicates of BCTs between the two taxonomies were removed and overlapping BCTs combined. Reducing the number of BCTs in this way ensured the communication tool could be explained to medical students during a single education session. Basic psychological principles suggest that memory and information processing are optimal when learners are presented with seven (\pm two) information chunks (Miller, 1956). We therefore included a maximum of seven broad behavior change domains within the communication tool framework and up to seven BCTs within each domain. Although these criteria restricted the specificity within the communication tool, it importantly allowed for the design of a succinct and comprehensible tool, tailored for medical students.

One author (AC) conducted this process and of the initial 126 BCTs, 23 (18.3%) were excluded as they contained shared elements of definitions, or were exact duplicates of other BCTs. For example, both definitions of 'imagery' and 'mental rehearsal' focus centrally upon imagining behavioral performance. Fifteen (11.9%) BCTs were also included within definitions of others (e.g. 'anger control training' could be one method of 'stress management'). It was judged that 25 (19.8%) BCTs could not be feasibly used within doctor-patient interactions (e.g. modelling behaviors to patients, or offering threats). Thirty three (26.2%) BCTs were also judged to be unsupported by sufficient evidence of efficacy. One

illustration is the conflicting evidence that although fear arousal is proposed as a motivating factor, it can also reduce individuals' motivation to change by encouraging removal of the fear source (e.g. health professional's message) rather than the risk (e.g. smoking) (Bellamy, 2004; Leventhal, 1971). Although many BCTs have conflicting evidence of their efficacy especially in various contexts, our judgments were primarily guided by literature review findings relating to behavior change interventions by medical professionals specifically. For example, research indicates that medical professionals may rely on information provision and awareness raising to motivate patients to change, which has been criticized as a generic and potentially ineffective approach (Katz & Faridi, 2007; Marteau & Lerman, 2001). Therefore, for this tool, set within the context of supporting clinical communication, fear-inducing and information-giving BCTs were excluded.

Thirty BCTs (23.8%) met the inclusion criteria and were selected for inclusion into the communication tool. For parsimony within domains, setting and reviewing goals were combined to form one BCT. Thus the final communication tool comprised 29 BCTs and seven broad behavior change domains. To further enhance memory and assist information processing, domains were organized into a memorable order by applying a familiar acronym (Karnadewi & Burt, 2010): *Tent Pegs* (T = Taking down barriers; EN = Changing the ENvironment; Th = Addressing Thoughts and emotions; P = Perform and practice; E = Empowering people to change; G = Achieving Goals; S = Social support). Each domain comprised three to six individual BCTs (see Appendix H).

The Tent Pegs framework was then formatted within a booklet clearly displaying one domain with its associated BCTs per page. Examples of BCTs being used 'in action' were also included on each page, through written examples of doctor-patient dialogue illustrating how patient cues can guide doctors in selecting salient BCTs for individual patients. For example, a patient may mention that smoking relieves stress at work, and the doctor responds by initiating discussion about stress management

(one BCT within the ‘addressing thoughts and emotions’ domain). This illustrates that although the Tent Pegs framework does not present exhaustively the BCTs identified within the broader behavior change literature, it does identify key areas of potential intervention for healthcare professionals. In line with clinical recommendations (NICE, 2007), it also supports healthcare professionals to tailor health advice to patients by selecting salient BCTs to use within clinical communication, based primarily upon what the patient expresses within those interactions. In this way, behavior change discussions remain patient-centered, which further aligns with the recommended approach to current clinical communication (Matthys et al., 2009; Stewart, 2001).

8.3.2 Communication tool validation

Due to the complexity involved in reducing and translating the behavior change literature into a usable tool for medical students, we wanted to validate the Tent Pegs booklet’s organization of BCTs into the seven behavior change domains. One approach to doing this is assessing its discriminant content validity (DCV). This has been used previously to test the validity of concepts proposed to be measured within questionnaires (Dixon, Pollard, & Johnston, 2007; Pollard, Johnston, & Dieppe, 2006), and recently to validate the content of a behavior change intervention framework (Cane, O’Connor, & Michie, 2012). In the present context, DCV methods were used to investigate the structure of the communication tool specifically by assessing how well BCTs fitted within the domains they were proposed to correspond within the Tent Pegs framework.

Participants and procedure

Individuals with expertise in psychology and/or behavior change were sought to participate in the DCV task. Postgraduate psychology students and health psychologists within a North West UK University were identified using university staff and student databases and invited to participate via email. The task was sent with instructions to willing participants via email. It involved reading through

definitions of eight behavior change domains (seven Tent Pegs domains plus one dummy domain), as well as 33 individual BCTs presented in a randomly generated order. Following this, participants allocated each BCT to at least one of the eight domains and rated their confidence with selected allocations on a 10-point scale (1=not at all confident; 10=extremely confident). Twenty-nine techniques within the seven Tent Pegs domains are displayed in Appendix H. Dummy BCTs comprised four techniques that exist within behavior change literature but that did not fit within any of the Tent Pegs domain definitions. They were direct instruction, financial incentives, provision of information, and explanation of health consequences. This domain was included to prevent participants making forced judgments about BCTs fitting into the Tent Pegs domains when they may instead have believed that specific BCTs didn't map onto any of the Tent Pegs domains. This also allowed exploration of participants' ability to identify BCTs that would not fit within the Tent Pegs framework, thereby testing the parameters of the Tent Pegs framework more broadly.

Analysis

Judges' confidence ratings for BCTs within each domain were summed and assigned positive scores for allocations matching the Tent Pegs framework, and negative scores for those that didn't. Summed scores were divided by the number of BCTs in each domain to account for variations in domain size. Thus standardized mean confidence ratings for each domain could be compared to the value zero using one-sample t-tests. Intraclass correlations [ICC] (using a 2-way mixed model to assess consistency) were also conducted to assess judges' agreement regarding their BCT-domain allocations. ICC values were interpreted to indicate that agreement was poor (<0.21), fair (0.21 to 0.40), moderate (0.41 to 0.60), or good-excellent (≥ 0.61) (Landis & Koch, 1977).

8.4 Results

Eleven judges completed the DCV task (six postgraduate psychologists and five health psychologists). Of these nine (82%) were female, nine (82%) were British and two Chinese (18%). Participants' mean age was 36 years (range = 23 – 55 years). Tests of normality including Shapiro-Wilks tests, exploration of skewness, kurtosis and Q-Q plots revealed that with the exception of one outlying data point (subsequently removed from the dataset) data for each domain were normally distributed. Thus one-sample t-tests were conducted to investigate the DCV of the Tent Pegs communication tool. Table 1 shows that for six of the seven domains, judges' confidence ratings were significantly greater than value zero (which would indicate no confidence). These six domains were 'taking down barriers', 'changing the environment', 'addressing thoughts and emotions', 'perform and practice', 'achieving goals', and 'social support'. This demonstrates that participants made BCTs-domain allocations consistent with the Tent Pegs booklet for most domains. Mean confidence ratings for these BCT-domain allocations ranged from 4.0 to 5.1 (out of 10) and ICC values showed good to excellent agreement between judges for five of these six domains, but poor agreement for the 'addressing thoughts and emotions' domain (see Table 1).

For BCT allocations within the dummy domain, confidence ratings were not significantly different from zero and ICCs show high disagreement between judges. Further, for one of the seven Tent Pegs domains ('empowering people to change') confidence ratings were also not significantly different from zero and ICCs show fair agreement between judges (Table 1).

Table 1. One-sample t-test and intraclass correlation results displaying judges' (n = 11) BCT-domain allocations, associated confidence, and levels of agreement.

Tent Pegs behavior change domain	Mean confidence rating (S.D.)	t(df)	Sig. (p)	95% CI* (lower-upper)	Intraclass Correlation
Taking down barriers (T)	5.06 (3.55)	4.73 (10)	.001	2.68 - 7.45	0.81
Changing the environment (EN)	4.72 (3.48)	4.50 (10)	.001	2.38 - 7.06	0.93
Addressing Thoughts and emotions (Th)	4.49 (3.69)	4.04 (10)	.002	2.01 – 7.00	0.11
Perform and practice (P)	4.03 (2.41)	5.55 (10)	.000	2.41 - 5.64	0.88
Empowering people to change (E)	1.17 (4.02)	.96 (10)	.359	-1.54 - 3.87	0.21
Achieving goals (G)	4.70 (1.62)	9.61 (10)	.000	3.61 - 5.80	0.90
Social support (S)	4.56 (3.02)	4.79 (9)	.001	2.41 - 6.72	0.88
Other (dummy)	2.41 (4.89)	1.63 (10)	.133	-.88 - 5.69	-0.82

Note. Confidence ratings were on a 10-point scale, 1=not at all confident; 10=extremely confident.

**Confidence Intervals*

To further investigate the non-significant result regarding the 'empowering people to change' domain, the distribution of judges' allocations was calculated (Figure 1). This showed that judges placed these BCTs most frequently within the corresponding Tent Pegs domain ('empowering people to change'). However, disagreement between judges was accounted for by these BCTs being allocated to five discordant domains as well ('addressing thoughts and emotions', 'perform and practice', 'social support', 'goal setting' and 'other'). Of these, the BCTs were most often mapped onto 'addressing thoughts and emotions'. Within this, 'imagery' was the only BCT to be mapped onto 'addressing thoughts and emotions' more often than the 'empowering people to change' domain.

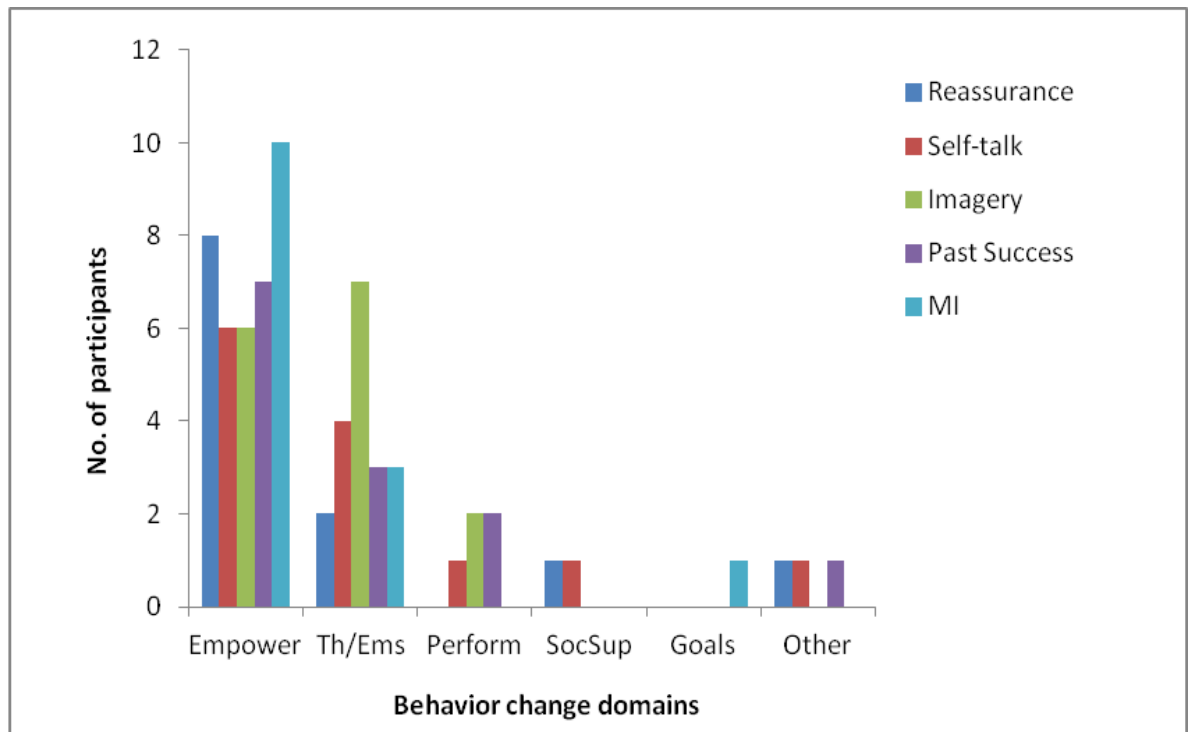


Figure 1. Distribution of BCT-domain allocations in relation to ‘empowering people to change’ BCTs

8.5 Discussion and conclusion

8.5.1 Discussion

To our knowledge, this is the first study to demonstrate how the evidence base on BCTs can inform the development of a communication tool for medical students (i.e. the Tent Pegs booklet). As there is growing recognition that medical school programmes should include more consistent behavior change education (Chisholm, Hart, Mann, et al., 2012; GMC, 2009; Moser & Stagnaro-Green, 2009), it is likely that evidence based educational tools such as this will benefit medical student learning and preparation for practice. This may ultimately support practicing clinicians to facilitate behavior change with their patients through providing them with the communication skills they may currently be lacking, and improving their confidence in discussing this topic within doctor-patient interactions

(Chisholm, Hart, Lam, et al., 2012). Empirical evaluations however, are required both in terms of assessing the validity of novel educational tools themselves, and also subsequently evaluating their efficacy in facilitating medical student learning and improving patient outcomes.

The present study assessed the validity of the Tent Pegs booklet, and found that judges made BCT-domain allocations that were consistent with six of the seven Tent Pegs domains. Thus it can be argued that overall the communication tool has good discriminant content validity. This analysis ultimately indicates that the 29 BCTs identified from the literature are accurately represented by the Tent Pegs domains. This meaningful organization of BCTs is important in the present context as it may serve to enhance student learning by highlighting groups of targetable behavior change determinants that could be addressed with patients, rather than expecting students to make sense of and apply the entire behavior change literature to their interactions with future patients.

Although most BCT-domain allocations were consistent with the Tent Pegs categorizations, participants were not confident in mapping BCTs onto one domain: 'empowering people to change'. Mean confidence scores for this domain were not being significantly different from the value zero (representing no confidence). Additionally, although judges demonstrated confidence in allocating BCTs to the 'addressing thoughts and emotions' domain overall, their level of agreement within this was poor (0.11). These findings may be accounted for by participants allocating 'empowering people to change' BCTs within a number of other domains instead. They most frequently matched the BCT 'imagery' to the 'addressing thoughts and emotions' domain. One possibility is that judges identified 'imagery' with attempting to change individuals' cognitions (i.e. addressing thoughts) rather than drawing focus onto previous successes (which aligns more closely with the 'empowering people to change' definition). Taking into account judges' allocations, it may therefore be more appropriate to include this BCT within the 'addressing thoughts and emotions' domain.

Participants were also not confident and showed high disagreement when allocating BCTs to the dummy domain. This domain included BCTs that didn't fit with any of the Tent Pegs domains and was primarily included to allow participants to identify BCTs that they believed did not map onto the Tent Pegs domains. Because findings showed that on the whole participants chose not to allocate BCTs associated with the Tent Pegs framework to the dummy domain, it can be argued that participants generally believed that the BCTs fitted within definitions of the seven Tent Pegs domains rather than the dummy domain. However, this does not explain why participants failed to correctly identify the four corresponding dummy BCTs. One possible explanation for the lack of a significant result regarding the dummy domain is that participants were exerting substantial cognitive effort to identify possible BCT-domain allocations, and were therefore more likely to place a BCT within a Tent Pegs domain than the dummy domain. This suggestion is also in line with anecdotal reports from participants that they found it difficult to make allocation decisions during the task and spent longer on the task than estimated during piloting (approx 20 minutes). Although this may indicate that judges were unable to identify BCTs that did not fit within the Tent Pegs domain, the findings as a whole suggest that participants agreed with the basic structure of the Tent Pegs communication tool.

A key strength of this study is the use of DCV methods to test the communication tool's validity. This allows judgments to be made regarding its structural organization without relying upon subjective cut-off values, which is more likely to lead to bias and is not therefore a desirable approach to take (Cane, O'Connor, & Michie, 2012). Furthermore, to enhance learning and the preparation of future doctors to facilitate behavior change with patients, the Tent Pegs communication tool itself is designed to be succinct and easy to understand. This was facilitated by the process by which BCTs were selected from the available evidence base. Thus far, other research has underused this evidence to inform educational interventions in this area (Chisholm, Hart, Mann, et al., 2012). This study therefore demonstrates a novel approach to applying behavior change science to medical education.

Furthermore, the Tent Pegs framework is supportive of a model of tailored health advice because it encourages medical students to follow patients' prompts to select the most suitable approaches to lifestyle change. This is congruent with clinical guidance that recommends that health professionals shape behavior change interventions to coincide with individual patients' contexts (NICE, 2007). However, it is noteworthy that results indicate that this communication tool has not been fully validated, and that minor revisions may improve the coherence of its structure (i.e. repositioning of the BCT 'imagery'). As previously acknowledged, the Tent Pegs tool is not comprehensive as it doesn't include all existing BCTs defined within the literature (Dixon & Johnston, 2010; Michie et al., 2011). Although there may be other BCTs worthy of inclusion within a communication tool of this kind, further research is needed to provide a rationale for which BCTs should be included. Finally, the Tent Pegs framework has not yet been tested as an educational tool within the context of the medical education learning environment and hence future research should pursue this in order to determine its efficacy as an educational intervention.

8.5.2 Conclusion

This study provides evidence that, on the whole, supports the basic structure of a communication tool to assist medical students discuss health-related behavior change with patients. Findings also indicate that it is possible to use the existing evidence base on BCTs to inform the development of valid materials for medical education in this area.

8.5.3 Practice implications

By drawing upon the available evidence base on behavior change, researchers and educators could improve current education for medical students and better prepare them for medical practice. This would contribute to meeting recommendations that medical students graduate with competence to discuss psychological and sociological aspects of behavior change with future patients (GMC, 2009).

By meeting this educational need, future doctors may be more prepared to discuss behavior change with future patients, thereby enhancing opportunities for successful behavior change facilitation within medical settings.

Chapter 9: A description of the design and evaluation of an educational intervention for medical students

(Thesis sub-section)

This chapter describes an in-depth account of the processes involved in the initial development of an obesity management education intervention delivered to medical students. This chapter will describe the research design that was originally proposed and the development of three outcomes measures that were initially intended for use within this study. These include a Theory of Planned Behaviour (TPB) questionnaire, a behaviour change knowledge measure, and a communication skills measure. Following this, there will be a discussion of the main challenges encountered when putting these research plans into action. The chapter will end by highlighting subsequent modifications made to both the research design and outcome measures. Following on from this, Chapter 10 will outline the intervention as it was delivered and evaluated. As this study was written in a format suitable for publication in an academic journal, its contents and length were restricted and some details of the full design process which are described in this chapter were omitted. Thus Chapter 9 provides a more complete account of this study's *development*, outlining the study design in full, and events which caused modifications to occur, whereas Chapter 10 will describe how the intervention study was finally *conducted* along with the results that were found.

9.1 Proposed study design for evaluation of the educational intervention

This study ultimately adopted a before-and-after research design (see Methods section, Chapter 10). Originally however, a longitudinal research design was proposed to assess participant outcomes in response to the educational intervention. Outcome measures were intended to be administered at three time points: up to a week before the intervention (time 1), one week following the intervention (time 2), and one month after the intervention (time 3). These time points were selected as they coincided with the period that students were still available during the academic year. The inclusion of a control group was also planned to control for any influence of the education students were receiving as part of their usual medical degree. A wait-list control group design was proposed in which all students would receive the intervention, but one group would receive it after completing the outcome measures at all three time points. Although the existence of already constituted teaching groups would prevent medical students being individually randomised to the intervention or control group, cluster randomisation of students who were allocated to one of four teaching hospital placements could be carried out. Finally, it was estimated that a minimum sample size of 30 participants per cell was required to provide an 80% chance of detecting a statistically significant change in responses to the outcome measures at $p < .05$. This estimation derived from conventional recommendations for conducting group comparisons (t-test / ANOVA) when evidence from the literature is not available to guide sample size estimations (VanVoorhis & Morgan, 2007).

9.2 Developing and validating outcome measures for the educational intervention: Behavioural beliefs, behaviour change knowledge and communication skills.

Chapter 10 describes the two outcome measures used within this study. These were the Theory of Planned Behaviour questionnaire and the communication skills task (see Outcome Measures section, Chapter 10). However, three measures were initially designed and piloted to assess the effects of the educational intervention upon changes in 1) the likelihood that students would engage in obesity

management discussions with future patients, 2) students' knowledge about behaviour change techniques, and 3) students' use of behaviour change communication skills within doctor-patient interactions. The following measures were designed to meet these aims:

9.2.1 Theory of Planned Behaviour (TPB) questionnaire

Constructing a TPB questionnaire. This questionnaire aimed to determine the likelihood that medical students would engage in the target behaviour i.e. discuss obesity management with future patients. The TPB was used to investigate this because it has been shown to predict and explain a range of behaviours, including clinician behaviours such as hand washing, use of antibiotic or asthma management guidelines, and provision of sexual health education to patients (Eccles et al., 2006; Perkins et al., 2007). The TPB questionnaire was designed following guidelines outlining distinct stages required to create a tailored measure appropriate for the study's specific aims and context (Francis et al., 2004). First, the behaviour of interest to was defined in terms of its Target, Action, Context and Time (TACT; *medical students' (target) engagement in constructive obesity management discussions with obese patients (action), when qualified as doctors (time), within medical practice (context)*). Next, salient beliefs underlying this behaviour were identified to determine which TPB constructs were relevant and should therefore be included within the outcome measure. To do this, relevant literature was identified which elicited medical trainees' and professionals' views and beliefs about discussing behaviour change with patients.

The results of this exercise indicated the potential for all the TPB constructs (intentions, attitudes, subjective norms and perceived behavioural control) to account for medical professionals' or students' engagement in obesity management discussions with patients. For example, evidence shows that doctors often miss opportunities to discuss health-related behaviour change with patients (Galuska, Will, Serdula, & Ford, 1999; Ma, Urizar, Alehegn, & Stafford, 2004). This is despite reports

that patients themselves would like doctors to raise the issue with them (O'Keefe & Coat, 2009; Pagnini, Wilkenfeld, King, Booth, & Booth, 2007) and that doctors view this topic as relevant and important to their patients' health (Chisholm, Hart, Lam, et al., 2012). One interpretation of this is that doctors' intentions may be prevented from being formulated or acted upon due to barriers such as those described above: for example, perceived role ambiguity or fear of damaging the doctor-patient relationship (Chisholm, Hart, Lam, et al., 2012). Research also suggests that doctors and medical students lack confidence in their ability to effect change in their patients, and display negative attitudes towards engaging in the necessary discussions to achieve this, reporting that the experience can be frustrating and unrewarding (Bruce & Burnett, 1991; Chisholm, Hart, Lam, et al., 2012). These findings implicate the role of perceived behavioural control and attitudes in determining the likelihood that medical professionals/trainees will discuss obesity-related behaviour change with patients.

Regarding subjective norms of medical students, other research suggests that implicit negative attitudes of senior medical educators may affect the extent to which medical students believe that discussing health-related behaviour change with patients is part of their clinical role (Litva & Peters, 2008). Specifically, it is suggested there is a lack of interest in and commitment to teaching/learning about behavioural and social sciences that lies within the hidden curricula of medical schools (Litva & Peters, 2008). Given that subjective norms are known to predict behaviour, it may be that this lack of social expectation to learn about these subjects prevents students from going on to engage in behaviour change discussions with future patients. As this literature illustrated salient beliefs about each of the TPB constructs in relation to our study's target behaviour, questionnaire items measuring medical students' intentions, attitudes, social norms, and perceived behavioural control (PBC) were included. A summary of this literature and its relevance to the outcome measure is illustrated within Table 1.

Table 1. Summary of evidence indicating the salience of Theory of Planned Behaviour (TPB) constructs to doctor-patient behaviour change discussions.

TPB construct	Evidence of salience to the target behaviour (<i>author's interpretive notes</i>)	Include within outcome measure?
Intentions	<ul style="list-style-type: none"> ❖ Doctors miss opportunities to discuss behaviour change with patients ❖ Patients want doctors to raise behaviour change issues more. ❖ Doctors believe behaviour change is relevant and important to discuss with patients. <p style="text-align: center;"><i>(together, suggests intentions are not made or fulfilled)</i></p>	Include
Attitudes	<ul style="list-style-type: none"> ❖ Doctors find behaviour change discussions challenging, unrewarding and frustrating. <p style="text-align: center;"><i>(suggests the presence of negative attitudes towards discussing behaviour change with patients)</i></p>	Include
Subjective norms	<ul style="list-style-type: none"> ❖ Some medical educators undervalue behaviour change education for medical students. ❖ Medical students may be influenced by educators' negative attitudes. <p style="text-align: center;"><i>(suggests significant others' may not display expectations that students discuss behaviour change with patients)</i></p>	Include
PBC	<ul style="list-style-type: none"> ❖ Doctors feel unskilled and lack confidence to discuss behaviour change with patients. ❖ Doctors are unconvinced that they will be able to help patients change health behaviours or that available behaviour change techniques work. <p style="text-align: center;"><i>(suggests doctors lack self-efficacy to facilitate behaviour change and perceive low control regarding this)</i></p>	Include

Notes. PBC = Perceived behavioural control. This table summarises the discussion of the literature provided above; the evidence relating to these points are described in the text above.

Each TPB construct can be measured using *direct items* assessing overall evaluations of each construct, and *indirect items* assessing more specific behavioural beliefs and outcome expectancies (Francis et al., 2004). According to the TPB, indirect items will measure beliefs contributing to individuals' broader expressions of attitudes, subjective norms, and PBC. Thus, in order to capture full representations of individuals' behavioural determinants in the present study, both direct and indirect items were constructed. Appendix B displays all items included in the initial questionnaire along with explanations about its construction. These comprised 38 items (14 direct; 24 indirect) which were presented to participants in a random order generated by an online number generator. All items included stems relating to one TPB construct (e.g. 'I am confident I can discuss obesity with

patients' for PBC) and responses were recorded on 7-point Likert scales. Odd numbered scales are recommended because they allow participants the opportunity to adopt a neutral stance when responding to items rather than potentially forcing positive or negative choices (Neumann & Neumann, 1981). Additionally, 7-point scales are designed in line with Miller's (1956) cognitive capacity theory which suggests that adult memory performs optimally when encoding seven chunks of information (\pm two). Smaller scales have also been criticised for not allowing enough variability in answers and larger scales have been shown to cause random responding by participants (Clark & Watson, 1995).

TPB questionnaire pilot. In line with recommendations (Francis et al., 2004), direct TPB items were tested for internal consistency using Cronbach's α because it was important to determine that items within each subscale were measuring the same constructs. It would not however, be appropriate to test for internal consistency of indirect items as it is plausible for individuals to hold positive and negative views about the same behaviour. For example, participants may feel that discussing obesity could jeopardise the doctor-patient relationship (negative attitudinal belief) but simultaneously believe such a discussion would improve patients' health (positive attitudinal belief). The 14 direct TPB items were therefore piloted in two rounds to 1st and 2nd year medical students at Manchester Medical School to investigate the internal consistency of each subscale (attitudes, subjective norms, PBC, intentions). A total of 313 1st year medical students in round 1 and 178 2nd year students in round 2 completed the questionnaire at the beginning of a lecture they were attending at the medical school. No demographic data were collected for these groups.

The results displayed in Table 2 show that internal consistency was lowest during round 1 of piloting. Therefore amendments to the direct TPB items were made following discussion with the research

team about item wording and also the contribution that each item made to the internal consistency findings.

Table 2. Internal consistency of direct items within the Theory of Planned Behaviour questionnaire for pilot testing (Versions 1 and 2) and the main study (Version 3)

TPB construct	Internal consistency statistic (Cronbach's alpha)		
	Version 1:Pilot (n = 313, year 1)	Version 2: Pilot (n = 178, year 2)	Version 3: Main study (n = 34, year 4 & 5)
Intentions	.781 (3 items)	.744 (3 items)	.910 (3 items)
Attitudes	.509 (5 items)	.718 (5 items)	.556 (5 items)
Subjective norms	.162 (3 items)	.719 (3 items)	.685(3 items)
Perceived behavioural control	.123 (4 items)	.410 (3 items)	.712(3 items)

Note. Cronbach's alphas above 0.7 are considered to demonstrate adequate internal consistency (Bland & Altman, 1997; Nunnally, 1978) however, for small groups of items (below ten) it is expected that acceptable alpha's will be closer to 0.5 (Pallant, 2001). Amendments between versions are displayed in Appendix C.

Appendix C presents the amendments made to direct items in the TPB questionnaire. One main alteration to these items was to simplify the wording to reduce the effort required to process and respond to the items. For example, the PBC item regarding the control students felt they have over discussing obesity with patients was shortened and simplified (see item 14 in version 1 & item 13 in version 2; Appendix C). The item wording was also made more personal to students, for example by including the phrase 'For me...' at the beginning of all attitude items. This was to encourage students to use personal views and experiences to answer questions instead of giving more generic answers they may have felt related to *most* students rather to themselves. Two attitude items were also replaced with alternative experiential terms that were more relevant to how obesity management discussions may be experienced in practice. Also, instead of asking participants if they felt under

social pressure, a less confrontational item was included which referred to people that participants regarded as important to them. This item still however, aimed to access beliefs about perceived social expectations. Items showing particularly low internal consistency were also removed; thus only three PBC items were included in version two. As shown in Table 2, internal consistency of these items improved in the second round of piloting although the PBC subscale remained below the advised benchmark of 0.5 (Pallant, 2001). Also evident from the results is that all reliability estimates (Cronbach's alphas) increased between round one piloting and the main study. Although two reliability estimates decreased slightly between round two and the main study, values for all subscales were ultimately above 0.5 indicating adequate internal consistency. This indicates that the piloting processes undertaken were beneficial in improving the overall validity of the measure used in the main study.

Targeting TPB constructs within the educational intervention. In addition to designing questionnaire items to assess changes in students' intentions, attitudes, subjective norms and PBC, the ways in which these would be targeted during the educational intervention was also considered, and is described here. Student-led discussions were used to encourage positive attitudes towards the target behaviour (i.e. engaging in obesity management discussions with patients). To promote views that achieving behaviour change is complex and warrants being addressed by doctors within various doctor-patient interactions, tutors facilitated brainstorming on two related questions: 1) What is it like to change your own behaviours? and, 2) What obstacles might occur for health professionals when considering obesity in patients? Information on the prevalence of lifestyle-related illness, and its prominence within clinical contexts was also presented by session tutors. Full tutor notes are displayed within Appendix D. Together this session content aimed to elicit beliefs that it would be valuable for students to engage in obesity management discussions with future patients. It was also expected that perceived social pressure to perform the target behaviour would be fostered through

tutors demonstrating their enthusiasm that students should engage in these discussions with patients. PBC was targeted through asking students to use behaviour change techniques during role plays, thereby eliciting opportunities for mastery, feedback and vicarious experiences. These approaches align with research identifying methods to improve self-efficacy, and particularly support using feedback on performance (Ashford, Edmunds, & French, 2010).

By targeting the above factors, it was expected that students' intentions to discuss obesity management with patients would also be increased. In addition to this however, the educational intervention was oriented towards encouraging the development of internal motivation rather than using external motivators such as financial incentives. This aligns with two well known learning/motivation theories: adult learning theory (Knowles, 1980), and self-determination theory (Deci & Ryan, 1985), both of which emphasise the importance of fostering internal motivation as a powerful predictor of intentions and behaviour. Therefore, during the session, student-led brainstorms were facilitated to consider how obesity might impact upon patients' health and well being. A range of clinical and non-clinical factors were prompted by tutors to encourage in-depth discussions. It was anticipated that by doing this students would construct for themselves, numerous examples of how obesity management relates to patient health and thus their motivation and subsequently intentions to manage obesity with patients would increase.

9.2.2. Behaviour change knowledge measure

A knowledge measure was designed to assess the extent to which students acquired knowledge about behaviour change techniques during the educational intervention. This construct was investigated because it is unknown whether knowledge of behaviour change techniques is a prerequisite to being able to use them in interactions with patients. Alternatively it might be that behaviour change communication skills would increase following the intervention, even if explicit

knowledge of behaviour change techniques did not. Hence, a measure was designed to assess explicit knowledge of behaviour change techniques. The measure consisted of 14 individual phrases representing communication approaches you might use to encourage patients to change unhealthy dietary/activity patterns. Seven of these were behaviour change techniques mapping onto the Tent Pegs framework used in the session. The other seven reflected topics which may be discussed in clinical interactions but were not labelled as behaviour change techniques within the education session. The 14 phrases were presented in a randomly generated order. Students were asked to highlight phrases they believed were helpful techniques to support patients with obesity-related behaviour change (see Appendix E). Participants could select between zero and 14 phrases. The maximum possible score was 7 (i.e. selecting all Tent Pegs behaviour change techniques, and no others) and minimum was -7 (i.e. selecting no Tent Pegs behaviour change techniques and all other approaches). Thus, selecting all 14 phrases would result in a score of zero.

Using the same cohort that was used for the TPB measure pilot, 310 1st year medical students completed the knowledge measure at the beginning of a scheduled lecture. Demographic data for this group were not collected. The knowledge scores were normally distributed and participants' mean score was 1.2 (S.D. 2.2, range -5 to 7) indicating low overall knowledge. Participants correctly selected an average of 5.2 out of 7 behaviour change techniques (S.D. = 1.5, range = 0 - 7) but also incorrectly selected an average of 4.0 out of 7 other techniques (S.D. = 1.9, range 0 - 7). Only 2 participants (0.6%) selected all 7 behaviour change techniques and no others; and none selected the opposite (i.e. no behaviour change techniques but all the others). Figures 1 and 2 display the selection frequencies for correct items and incorrect items separately. These show that greater numbers of participants selected more correct items than incorrect items. Other investigations revealed that just 28 participants (9.0%) selected all 14 options provided (all behaviour change techniques and all others) but that the overall range of selection spanned from 1 - 14 items. This can be interpreted as

an indication that participants did not indiscriminately select all available options due to a possible lack of knowledge. Thus it is suggested that participants in this sample were engaging in the task given to them. Overall it was observed that participants' responses to this measure varied; they selected numerous combinations of items and scores were wide ranging. Further, although participants identified more correct items than incorrect items, the average level of knowledge (i.e. mean knowledge score) was low. This corresponds with what was expected because these students had not received any previous training about behaviour change techniques. Despite this low overall knowledge, participants were unlikely to select all items on the list, suggesting that the format of the measure was appropriate and it was likely to elicit variance in the data collected. It was therefore agreed that no changes to this measure were required prior to administration in the main study.

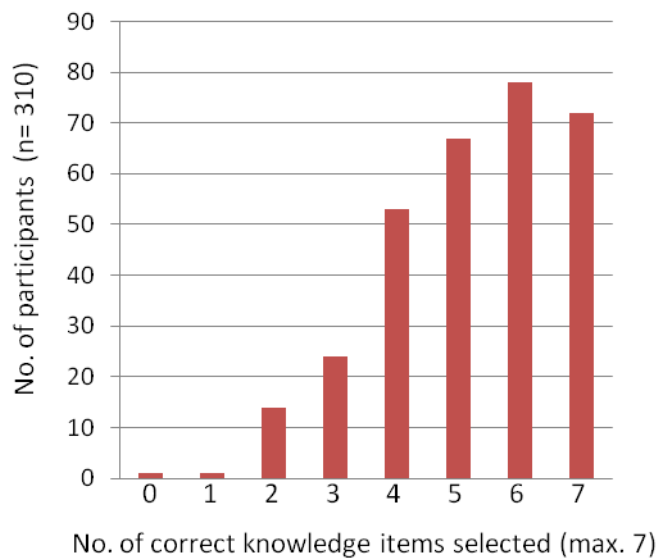


Figure 1. **Number of participants (n = 310) who selected correct knowledge items (behaviour change techniques)**

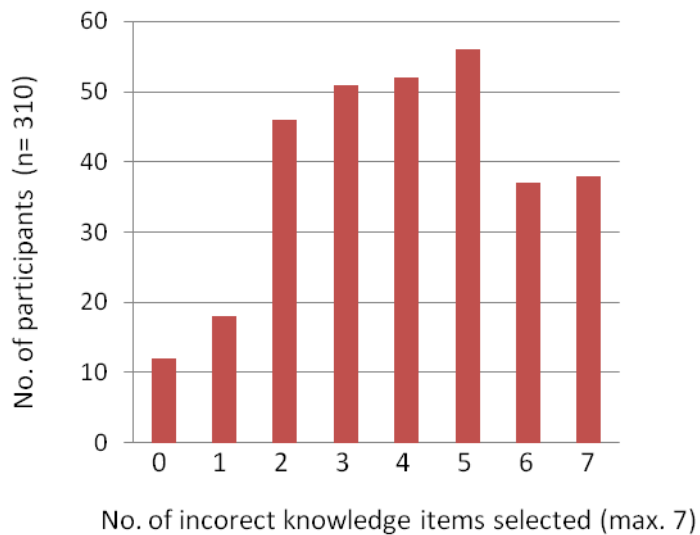


Figure 2. **Number of participants (n = 310) who selected incorrect knowledge items (non-behaviour change techniques)**

9.2.3. Communication skills measure

Within the present study it was not possible to assess participants' skills in practice, for example, through Objective Structured Clinical Examination (OSCEs), or via observation of student-patient interactions. This type of observation has been used in the past to obtain measures of medical students' empathy, as well as their alcohol and smoking counselling skills (Boehlecke et al., 1996; Evans, Stanley, & Burrows, 1993; Walsh, Sanson-Fisher, Low, & Roche, 1999). In order to maintain some objectivity in the present study, a proxy measure was developed to investigate medical students' *perceptions* of the communication strategies they would use when interacting with obese patients. Nine different patient scenarios were developed based upon the Tent Pegs behaviour change domains, to simulate patients whose health would benefit from changing obesity-related behaviours. Students were asked to read the patient scenarios and write down what they would say to each patient to encourage behavioural change. Appendix F shows all nine scenarios as they were presented to students. It was intended that students would complete different patient scenarios

before and after the intervention to minimise repeat testing effects. However, to prevent confounding factors influencing the results, it was also important to present students with scenarios of equal difficulty and with similar characteristics.

To standardise scenario characteristics, they were presented in a consistent format; 1) a three or four sentence paragraph outlining the patients' personal details and weight related health problem, 2) a short statement summarising the patients' views on their own health behaviours. For example, within one scenario a patient named Mr Baker is described in terms of his age, place of work and home. His health condition is outlined in relation to his weight and weight loss attempts. A paragraph from Mr Baker's perspective then follows containing indications about his thoughts on the matter. A similar structure but different content is included in an alternate scenario with Mr Banks. Both patient scenarios are displayed below to illustrate this.

Example scenario 1.

Mr Baker is 48 years old, works close to the city centre and lives with his wife and 2 children nearby. His blood cholesterol levels and blood pressure have been increasing over the last 2 years and his BMI is now 32. Mr Baker has a busy life and has struggled to lose weight in the past.

Patient statement: "I know I've got to keep an eye on my blood pressure, especially now but I'm going to find it hard to get rid of the weight, it's such a big task and with my job and kids and all, it seems like a mountain to climb, it's too much to do all in one go"

Example scenario 2.

Mr Banks is 65 years old and has a large family with 6 grandchildren. He was diagnosed with osteoarthritis 10 years ago and has a BMI of 36. He has been told before that controlling his weight

would ease the pressure on his joints and over the years he has noticed that at lower weights he experiences less pain.

Patient statement: "One of the things I miss out on is taking my grandchildren swimming. I'm nervous about going along with them and them tiring me out but I'm sure if I put my mind to it I could do it. I did before; I've got out of the habit of it really"

To account for difficulty, 12 expert raters (n = 8 trainee psychologists; n= 4 trainee doctors) provided feedback on the nine patient scenarios. They were asked to rate the difficulty involved in answering each patient scenario on a 7-point scale (1 = Not at all difficult to answer, 7 = Very difficult to answer), and also provide comments about the difficulty and credibility of the scenarios. Written comments were collated by AC. Only minor modifications were made as overall feedback about the clinical credibility, layout and wording of the measure was positive. Examples of amendments made include grammatical clarification and provision of further detail within vague scenario descriptions. Raters also specifically reported that scenarios with more emotional content (3 & 5) seemed more difficult to respond to (see Appendix F). This is illustrated by feedback from the following raters:

"This is difficult to deal with as it is clear she is talking about emotional eating, and I imagine this is a hard thing for doctors to deal with in consultations and a hard thing for the patient to overcome"

(Rater 8_scenario 3)

"Yikes! Heartsink. He is accepting of his state, has little motivation to change and lacks the self efficacy to make progress. I don't have much in my tool box to work with on him" (Rater 6_scenario 5)

However, this feedback reflects the intended focus of these two scenarios. To ensure scenarios would provide opportunities for students to demonstrate skills along all seven behaviour change techniques

domains within the Tent Pegs framework, each scenario was written with a particular emphasis (but not an exclusive focus) on one of these domains. However, as the proposed research design included three points of data collection, nine scenarios were required in total (3 scenarios per time point). In order to avoid repetition within the scenarios, cognitions and emotions were focused upon in separate scenarios, as were performance and practice (see Appendix F). Thus, the raters' feedback above reflects the objectives of scenarios 3 and 5 which were to prompt the use of behaviour change techniques relating to addressing emotions and empowering people to change, which are more inherently geared towards discussing emotional aspects of behaviour change than the other scenarios. Raters also reported that more specific and identifiable barriers within patient scenarios were easier to respond to because there was something concrete to target (e.g. physical barriers identified within scenario 7). These comments informed minor modifications and also reflected some of the intended differences in scenario content. Perceived response difficulty was further investigated using raters' quantitative scores.

A test of normality (Shapiro-Wilk) showed that scores for most scenarios (1 -3 & 5 - 7) were normally distributed ($p > .05$) but that data for scenarios 4, 8 and 9 were not normally distributed ($p = .035$, $p = .001$, $p = .017$ respectively). Friedman's ANOVA was therefore conducted and revealed a main effect of the different scenarios upon difficulty scores ($\chi^2(8) = 36.50$, $p = .000$). However, post-hoc multiple comparisons (Wilcoxon Signed-Rank tests) revealed no significant differences between specific scenarios when using a Bonferroni-adjusted significance level ($.05/36 = .001$). These findings support the argument that the different patient scenarios were relatively similar in difficulty level. Although this indicates *statistical* similarity, differences between the median scores remained. To ensure that outcome measures were as equivalent as possible across time points, median values were used to categorise scenarios into easy, medium and hard scenario types. Hence, in order to fit with the

proposed research design and balance scenario difficulty, the outcome measures were designed so that students would respond to an easy, medium, and hard scenario at each time point (see Table 3).

Table 3. Presentation of patient scenarios by time point in relation to raters' difficulty scores (n = 12).

Difficulty category	Scenario number (Median difficulty rating)		
	Time 1	Time 2	Time 3
Easy	Scenario 4 (M=2)	Scenario 7 (M=3)	Scenario 9 (M=2)
Medium	Scenario 2 (M=3)	Scenario 3 (M=4)	Scenario 6 (M=3)
Hard	Scenario 1 (M=5)	Scenario 5 (M=5.5)	Scenario 8 (M=5)
Data collection time point	Time 1	Time 2	Time 3

Note. Difficulty ratings made on a 7-point scale (1 = Not at all difficult to answer, 7 = Very difficult to answer). Time 1 = baseline; Time 2 = 1 week follow up; Time 3 = 1 month follow up.

9.2.4 Other findings from pilot data

Guidelines suggest piloting all TPB items in terms of their wording and formatting with a small group of around five individuals (Francis et al., 2004). Thus, ten medical students intercalating in Psychology were invited to provide feedback on the entire questionnaire. These were students spending a year out of usual medical school education to undertake an undergraduate psychology degree course. Thus, they were a comparable group to the cohort of medical students who were invited to participate in the final intervention. They were invited to take part in this piloting exercise via email and their feedback was obtained via written responses to the following questions:

- Are any items ambiguous or difficult to answer?
- Does the questionnaire feel too repetitive?
- Does it feel too long?
- Does it feel too superficial?
- Are there any annoying features of the wording or formatting?

Four students responded and reported satisfaction with item wording, and format, and with the questionnaire length and format. They also reported engaging particularly well with the skills scenarios. One student, for example: *“found the written section quite deep, because I felt you had to think about the person when answering the question, not just rattle out a generic answer”* (ID02).

Therefore no further changes were made to the layout of the questionnaire, or its components (TPB items, knowledge measure, or skills scenarios). In addition to providing feedback on the questionnaire, this group of students were also asked to provide responses to the indirect items at two time points (two weeks apart) to allow for investigations of its test-retest reliability. However, as data from only two students were obtained, this analysis was not conducted. Instead, test-retest reliability was planned to be assessed using the control group in the main study. However, due to poor uptake within the main study, it was not possible to complete this analysis either. A full description of response rate in the main study is described below (9.3).

9.3 Amendments to outcome measures and the research design within the main study

During recruitment within the main study, it became apparent that alterations to the research design and outcome measures were required. Due to unforeseen changes to the curriculum structure, the educational session offered to students changed from being delivered as a compulsory element of the Year Five programme, to being advertised as a voluntary session. This was problematic in terms of retaining a wait-list control group in the study because students now had to volunteer to be part of the control group by completing outcome measures but not attending the education session at any point. Unsurprisingly only two students who did not attend the education session completed the outcome measure at time 1, and none completed it at time 2. The control group was therefore removed from the study design. Another major alteration was made to the length and format of the outcome measures. The initial outcome measures were sent to students registering interest in attending an educational session. However, only 20 of the 92 students that registered interest in

attending a session began the online outcome measure at time 1 and just 11 students completed the whole questionnaire (12% response rate). It is likely that low response rates were due to the change in the way the session was advertised to students and also due to the lengthy online version of the outcome measures which included 50 items (including demographic data collection items) over 11 pages. These concerns were further reflected by the low number of students completing the online outcome measures at time two following the educational session: seven began the questionnaire, four completed TPB items, two completed skills items and three completed knowledge items.

Within the literature, the challenging nature of medical education research has been acknowledged, along with suggestions about how to overcome the barriers to researcher-educator collaborations (Murray, 2002; Schuwirth & Van Der Vleuten, 2006; Stoddard & Kalishman, 2010). For example, successful collaborations are said to be cultivated through the building of relationships and maintenance of regular communication with key institutional figures (Stoddard & Kalishman, 2010). Researchers are also advised to clarify their motivations, values and expectations about research collaborations prior to its commencement (Stoddard & Kalishman, 2010). Upon reflection, these issues may have influenced recruitment efforts within the present study; especially because decisions regarding the educational intervention's delivery format and structure were made by senior educationalists. Stronger and more sustained relationships with influential faculty members may therefore have resulted in better establishment of the education session initially, and this may have subsequently led to greater attendance to the intervention and acquisition of data. However, educational research has often been viewed as a low priority field, and educators/clinicians may find highly specialised medical education research uninteresting (Murray, 2002; Schuwirth & Van Der Vleuten, 2006). These cultural barriers to medical education research may therefore impede upon collaboration efforts. In light of the challenges faced within the present study, it was decided that modifications were required to improve participants' attendance and retention to the study.

The full outcome measure was subsequently re-designed so that it could be administered on a two page hard copy version immediately before and then after the education session itself (see Appendix G). To allow for this reduction in size it was decided that a maximum of three direct TPB items per subscale, and one skills measure scenario would be retained. These items were selected as they represented constructs that were most closely aligned with the primary outcome; to identify the likelihood that students would go on to engage in obesity management discussions with patients (measured by TPB items) and that those discussions would be constructive (measured by skills items). One example of an alteration to the TPB measure was the preservation of three selected attitude items along with the removal of two items regarding how 'unimportant-important' and 'unrewarding-rewarding' students thought behaviour change discussions with obese patients would be. This decision was made so that a broad measure of participants' attitudes (good/bad), along with more specific items assessing both the experiential (worthless/valuable) and instrumental (unpleasant/pleasant) attitudinal elements could be retained (Francis et al., 2004). For the communication skills measure students were asked to respond to one scenario pre-intervention (#2) and an alternative scenario (#7) post-intervention. The scenarios were selected to differ in content to avoid repetition effects, but both received median difficulty ratings of 3 out of 7 (see Table 3). As described within Chapter 10 (Results section), the final study sample comprised 34 students that completed the outcome measure at two time points (pre- and post-intervention).

9.4 Chapter 9 summary

This chapter has outlined the procedures involved in designing, piloting and amending the research design and outcome measures used within an obesity management educational intervention for medical students. The different validation methods used for each outcome measure reflect thorough piloting procedures that were tailored to suit the investigation of each individual construct (i.e. likelihood to engage in obesity management discussions with patients, behaviour change knowledge, and communication skills). Although the intended research design was not fully implemented in the main study, the aim was to build upon existing evaluations of similar studies which have been shown to often omit any post-intervention measure and rely solely upon self-reported change in behaviour change knowledge and skills (Chisholm, Hart, Mann, et al., 2012). Although it was not possible to apply a randomised controlled trial to evaluate the educational intervention, a detailed and robust research design has been described which could be adopted by future studies. However, it will be important to address common barriers to conducting research within medical education settings (e.g. Stoddard & Kalishman, 2010). Despite the challenges outlined in this chapter, Chapter 10 demonstrates how this intervention was ultimately successfully delivered within a medical education setting, and indicates key findings regarding its feasibility, acceptability and potential efficacy.

**Chapter 10: Educating medical students about behaviour change techniques: A feasibility study
using the theory of planned behaviour**

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Conference presentation:	Oral presentation. <i>UK Society of Behavioural Medicine</i> , Manchester, December 2012.

10.1 Abstract

Objectives. Obesity-related illness is a major health concern and doctors frequently encounter patients who would benefit from modifying their health behaviours. Doctors have called for training in effective behaviour change communication, and medical students are now expected to gain these skills during medical school. Current evidence about behaviour change techniques that are congruent with behaviour change theory has been inconsistently applied to medical education. Our aim was to pilot an educational intervention with medical students to meet this need.

Methods. An education session for medical students about behaviour change theory and techniques was evaluated using a before-and-after design. Thirty-four students completed pre- and post-intervention questionnaires. A theory of planned behaviour (TPB) questionnaire was used to assess changes in behavioural determinants of engaging in obesity management discussions with patients, and a systematically evaluated skills measure investigated students' communication in response to patient vignettes. Consistency of intervention delivery was investigated via a fidelity analysis, and satisfaction with the session was explored using student feedback.

Results. Following the session, all TPB construct scores and communication skills (including listening, empathy and patient-centeredness) significantly increased. GP trainees successfully delivered the sessions to students consistent with the intervention protocol; students were highly satisfied, and advocated its inclusion within undergraduate medical programmes.

Conclusions. Theory-based behaviour change education can be successfully delivered by GP trainees within undergraduate medical education. Students found the session valuable and acceptable, and quantitative analyses suggest it may increase the likelihood that students engage in constructive obesity management discussions with future patients.

10.2 Introduction

Chronic non-communicable illnesses are responsible for 63% of global mortality, translating to approximately 36 million annual deaths (World Health Organisation, 2008a). Obesity is associated with many of these including diabetes (Han, Lawlor, & Kimm, 2010; Steyn, Lambert, & Tabana, 2009), liver disease (Larsson & Wolk, 2007), cancers and heart disease (Katz & Faridi, 2007). Estimates by the English National Audit Office (2001) suggest that on average, obesity reduces life expectancy by nine years. This is of concern within the UK as obesity prevalence has tripled in the last 30 years (26% have a Body Mass Index [BMI] of $>30 \text{ kg/m}^2$) and projections estimate that 50% of women and 60% of men will be obese by 2050 (NHS, 2012; National Obesity Observatory, 2010). Worldwide, estimates suggest that 68% of males and 64% of females (between 15 and 100 years old) currently have a BMI of $\geq 25 \text{ kg/m}^2$ (World Health Organisation, 2010). Globally, obesity is now regarded as an epidemic (Alpert & Powers, 2005; Treyzon, 2005; Wise, 2011) as it has remained largely resistant to public health efforts and has not reduced in prevalence compared to other health problems such as tobacco use, injuries and infectious diseases (Swinburn et al., 2011).

Obesity is governed by modifiable health behaviours (e.g. physical activity and diet) and there is concern that major achievements in developing pharmacological and surgical treatments for cardiovascular diseases will be short-lived if reductions in fat, salt and alcohol intake and sedentary lifestyles are not made (Ferrannini, & William 2012; Ibrahim & Damasceno, 2012). Hence lifestyle risk factors require preventive approaches and public health professionals warn that unless preventative healthcare services are funded adequately, governments will be unable to meet the funding demands of healthcare services attempting to treat rising numbers of patients with lifestyle-related illnesses (Tsou, Mackie, & Sim, 2006). There are calls for health professionals to incorporate preventive medicine approaches into clinical practice (NICE, 2006) and for medical students to be educated in discussing obesity and behaviour change with patients (GMC, 2009). Together, these influences

highlight the expanding role for health professionals in tackling obesity-related behaviours with patients and crucially, in facilitating health-related behaviour change.

Research has indicated that doctors require education in this area, in response to specific barriers to discussing behaviour change with patients (Chisholm, Hart, Lam, et al., 2012; Galuska, Will, Serdula, & Ford, 1999; Ma, Urizar, Alehegn, & Stafford, 2004). Doctors report lack of skills and confidence to help patients change their behaviours, fear of damaging relationships with patients, lack of opportunities to discuss behaviour change and uncertainty about the extent to which this is part of their role (Chisholm, Hart, Lam, et al., 2012). This indicates an educational responsibility to equip doctors with relevant skills, clarify their roles regarding behaviour change facilitation, and empower them to capitalise upon opportunities to discuss behaviour change with patients without damaging the doctor-patient relationship.

A range of strategies have been identified to support people in achieving behavioural change, such as motivational interviewing, goal setting and optimising social support (e.g. Dixon & Johnston, 2010; Michie, et al., 2011). Many of these behaviour change techniques are congruent with established health behaviour theories (see, Abraham, & Michie, 2008; Michie, Johnston, Francis, et al., 2008) such as the Theory of Planned Behaviour (Ajzen, 1991), Social Cognitive Theory (Bandura, 1997) and Control Theory (Carver, & Scheier, 1982). This evidence however, has yet to be applied consistently to medical education (Chisholm, Hart, Mann, et al., 2012), possibly due to difficulties in identifying suitably qualified staff to deliver it or lack of space within the curriculum (Litva & Peters, 2008). Therefore, as well as considering what makes up effective educational content, it is also important to consider how this education is best delivered.

To identify solutions to these issues, development and evaluation of educational interventions for medical students in this area are needed. Well designed obesity management education should be assessed for its potential efficacy as an educational intervention (e.g. via investigating salient changes in participants' behaviours), and for feasibility and acceptability within medical programmes (e.g. through fidelity analyses and explorations of participant satisfaction respectively). Regarding the former, one model that has demonstrated good predictive power in relation to short term behaviour change across various contexts (Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002; Sutton, 2004) is the Theory of Planned Behaviour (TPB) (Ajzen, 1991) which proposes that attitudes, subjective norms, perceived behavioural control (PBC), and that intentions are key behavioural determinants. Meta-analyses show that, on average, TPB constructs explain 27-50% of variance in intentions and 26-39% in behaviour (Armitage & Conner, 2001; Sutton, 2004). Importantly, TPB has also been used to explain clinicians' behaviours (Eccles et al., 2006; Francis et al., 2009; Perkins et al., 2007) and demonstrates comparable levels of explained variance within these health professional populations (Eccles et al., 2006). Thus the TPB may be a useful framework for assessing medical students' likelihood of engaging in constructive behaviour change discussions with obese patients. Our specific research questions were as follows.

Research questions

- 1) Can behaviour change education for medical students improve their likelihood of engaging in constructive obesity management discussions with future patients?
- 2) Is implementation of this educational intervention feasible within an undergraduate medical programme and is it acceptable to students?

10.3 Methods

Design

A before-and-after study investigating the efficacy, feasibility and acceptability of an educational intervention. The target population was medical students and the target behaviour was engagement in constructive obesity management discussions with patients.

Participants and procedure

Approval from the relevant NHS (ref. 2011/253) and University (ref. 11259) ethics boards was obtained. Medical students studying within the final two years of their university degree at a large medical school in the Northwest UK were invited to attend an education session on lifestyle change communication. Forty-one students attended one of five education sessions.

GP trainees were trained by the authors to deliver sessions for two reasons. Firstly, this would create a feasible and sustainable delivery model within an undergraduate medical programme. This coincides with recommendations that qualified doctors develop teaching roles to facilitate transfer of expertise to students (Schofield, Bradley, Macrae, Nathwani, & Dent, 2010). Secondly, this approach would ground session content within clinical contexts and emphasise its relevance to students. GP trainees were recruited from specialty training (ST) programmes in Greater Manchester. Two tutor training sessions were conducted in January and February 2012. In total, 76 GP STs (16 = ST year 1, 16 = ST year 2, 44 = ST year 3) were invited to attend a tutor training session and of these, 34 (50.8%) volunteered to deliver the session to medical students. Of these, eight were randomly selected and went on to deliver one or two of five sessions, in pairs, to medical students.

Before attending the education sessions all 41 students were emailed and invited to take part in this research which would involve completing questionnaires before and after attending the session. On completion of each questionnaire they were offered the opportunity to take part in a prize draw (£100 voucher). Students either completed the questionnaires using an online email link (n = 5, 14.7%) or on a hard copy available on the day of the session (n = 34, 85.3%). Following the session, all participants were invited by email to provide feedback on the session.

Intervention

The educational intervention developed for this study consisted of a three hour session and was designed following review of relevant literature. This involved drawing upon education theories which aim to optimise education through developing session materials and formats that target determinants of successful learning (Bandura, 1986; Kaufman & Mann, 2010; Knowles, 1980; Schmidt, 1993; Swanwick, 2010). Identifying key learning principles related to these theories allowed us to develop theory-based education for medical students (Table 1 demonstrates how these principles were applied to the session).

We also consulted the evidence-base on behaviour change techniques (Dixon & Johnston, 2010; Michie et al., 2011) in order to inform the educational content that would equip students with relevant and useful subject knowledge and skills. The session content focused on obesity-related behaviour (e.g. healthy eating and physical activity) and students were introduced to 'Tent Pegs' a behaviour change booklet (developed by AC) which comprised 29 theory-linked behaviour change techniques, presented within seven broad behaviour change domains (see Figure 1). Students were encouraged to use patient cues to select appropriate behaviour change techniques, thereby tailoring health advice to each patient. For example, if a patient discloses feeling overwhelmed by the task of making change, the student may select a technique within the 'achieving goals' domain (e.g. graded

tasks). Alternatively, if a patient highlights using smoking/unhealthy eating to manage stress, the student may select a technique within the ‘addressing thoughts and emotions’ domain (e.g. stress management). Students observed video clips of patients discussing obesity-related health problems and practiced using the Tent Pegs behaviour change techniques in role play scenarios (see Table 1 for descriptions of educational content).

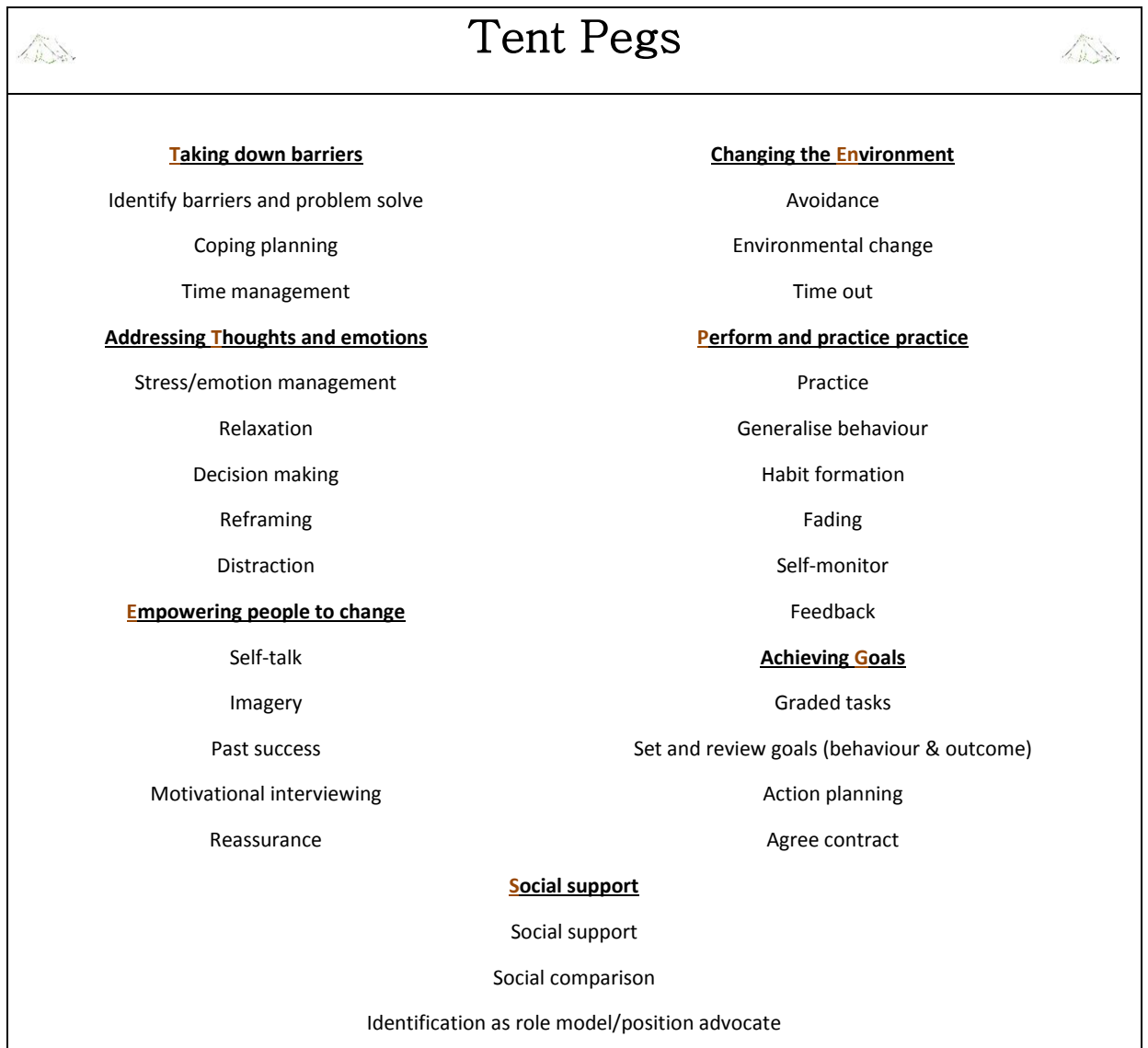


Figure 1. ‘Tent Pegs’ behaviour change technique framework used within an educational intervention for medical students.

*For full details of the Tent Pegs booklet, see Appendix H (non-written attachment)

Table 1. Breakdown of educational intervention components and descriptions of associated aims and rationale

Section	Description of components	Aims and rationale of the session component
1. Introduction	1.1 Initial introductions and outline of session structure	Introduce students and tutors and make students aware of the different sections within the session (<i>acts as an ice breaker to create a relaxed atmosphere for learning; outlining what to expect from the session should enhance engagement</i>).
	1.2 Case example: Audio recording of a GP discussing one patients' story	Raise curiosity in the subject (<i>aids learning via activating internal motivation</i>), and orient students to the type of patients/clinical scenarios the session relates to (<i>base learning in clinical context</i>).
	1.3 Outline the session objectives	Define what students should take away from the session as a whole (<i>to clarify the scope and parameters of the session</i>).
	1.4 Why behaviour change?: Involves information and discussion around the rationale for the education session	Highlight that the session is relevant to healthcare settings and the occupation of a doctor (<i>emphasising personal relevance; prompting internal motivation</i>). Highlight this is a skill that is difficult but can be mastered through training. Brainstorm task will enhance engagement with session, and encourage students to come to their own conclusions about why this topic is important (<i>self-directed learning; interactive learning method, likely to be more powerful than prescriptive information alone</i>).
2. Complexities of behaviour change	2.1 Brainstorm: Describing personal experiences of behaviour change attempts	Both tasks illustrate the <i>complex</i> nature of behaviour change. Task 2.1 encourages students to reflect on the difficulties involved in behaviour change and grounds this thinking in their personal experiences (<i>emphasises personal relevance of the topic; using past knowledge to learn new concepts/skills in line with problem-based learning</i>).
	2.2 Brainstorm: Consider the impact of addressing lifestyle change on job of doctor	Task 2.2 emphasises that the complexities of behaviour change are relevant within healthcare settings. Tutor anecdotes should further enhance the relevance of this to students as future doctors (<i>highlights relevance to stimulate learning; interactive learning method supporting engagement; encourages self-directed learning as students identify their own learning needs</i>).
3. Behaviour change techniques	3.1 Video clips: Hearing patients' thoughts about lifestyle change discussions	Expose students to the consequences of positive versus negative doctor-patient interactions (<i>activates internal motivation to learn through evoking curiosity</i>) from the perspective of real patients (<i>based within clinical context</i>).
	3.2 Communication strategies to avoid: Involves information about what doesn't work to facilitate patient behaviour change	Multi-modality learning with various anecdotal examples to discuss (<i>interactive and social learning methods</i>). Underpins why some behaviour change strategies are not successful (<i>allows uptake of knowledge and 'knowing how' before being asked to demonstrate skills</i>).
	3.3 Helpful communication strategies: Involves information about what does work to facilitate patient behaviour change	Illustrate relevance to doctors' jobs here by highlighting that NICE expects doctors to tailor interventions to patients and address specific barriers to change with them (<i>emphasising relevance</i>). Provide students with descriptions of helpful strategies with examples grounded in clinical contexts (education based in context) and using engaging educational materials such as the Tent Pegs behaviour change technique booklet with illustrations and examples of concepts within it (<i>interactive learning method</i>).
	3.4 Group role play: Students decide together how to respond to a patient scenario	Opportunity to practice skills (<i>enhances self-efficacy via mastery of skills and vicarious experience</i>). Learning from others at the same time as having a go as individuals (<i>facilitates social learning</i>).
	3.5 Role play in pairs: Students try out learned behaviour change techniques within a simulated scenario	Another opportunity to practice skills more intensively and with the opportunity to get feedback immediately from peers (<i>facilitates social learning</i>). Also enables reflection of having a go at implementing this novel skill (<i>reflective practice; builds self-efficacy through mastery and vicarious experience</i>).
4. Summary	4.1 Reflection on the session: Discuss what each student will take away from the session and review objectives	Reflecting specifically here on the fact that students have achieved something today in using BCTs in simulated clinical contexts (<i>building self-efficacy; reflective practice</i>). Also an opportunity to prompt thoughts about how learning from this session can be taken forward into future clinical interactions with patients (<i>enhancing relevance and basing education within the clinical context</i>).

Table Notes. Learning principles from the following theories are mapped onto session content and italicised within parentheses. Principles from adult learning theory (Knowles, 1980) include capitalising upon internal motivators, enabling reflective practice, using self-directed and problem-based learning (thus activating elaboration of prior knowledge) (Kaufman & Mann, 2010; Schmidt, 1993; Swanwick, 2010). Miller's clinical competence pyramid indicates: 'knowing', 'knowing how', 'showing how', and 'doing' (see Wylie & Holt, 2010, p. 255), thus highlighting the role of acquiring and demonstrating skills as well as knowledge. Social cognitive theory (Bandura, 1986) (applied to medical education) acknowledges that social and interactive aspects of education influence learning and advocates enhancing self-efficacy through mastery, vicarious experience, verbal persuasion, and optimising physiological learning states (e.g. relaxed not aroused) (Swanwick, 2010). Other key principles are learning in context and enhancing educational relevance (Bundy et al., 2010)

Outcome measures

1. Theory of Planned Behaviour (TPB) questionnaire

A TPB behaviour questionnaire was developed to measure change in theoretical determinants of the target behaviour (Ajzen, 2002; Francis et al., 2004). We defined the target behaviour in terms of its Target, Action, Context and Time (TACT) as follows: *medical students' (target) engagement in constructive obesity management discussions with obese patients (action), when qualified as doctors (time), within medical practice (context).*

Next, salient beliefs relating to this behaviour were identified from a previous qualitative study which elicited medical trainees' and professionals' views on discussing behaviour change with patients (Chisholm, Hart, Lam, et al., 2012). The final questionnaire included items measuring each of the TPB constructs (intention, attitudes, subjective norms, PBC). Items directly targeting each TPB construct were used and included stems such as 'I am confident I can discuss obesity with patients' (for PBC), and responses recorded on a 7-point Likert scale (strongly disagree - strongly agree). Consistent with recommendations (Francis et al., 2004), three separate items were included to assess each behavioural determinant (totalling 12 items). Scores for each behavioural determinant derive from mean scores across subscale items. Thus each participant receives an overall attitude, subjective norm, PBC and intention score pre- and post-intervention. Following tests for normal distribution the appropriate within group comparisons were subsequently conducted for each TPB subscale to compare pre- and post-intervention scores.

2. Communication skills task

To assess change in communication skills, students provided written responses to patient scenarios pre- and post-intervention. Within these responses, students' use of behaviour change techniques and general communication skills were identified. Two vignettes (one presented before and one after

the session) comprised one paragraph explaining the patient's history (e.g. patients' name, age, presence of illnesses, obesity status, recent health advice from doctor) and one short statement from the patient themselves (< 100 words) regarding their weight loss experiences (e.g. their reaction to any changes in their health status, and intentions to change). Students were asked to respond by writing down what they would say to the patient in order to support them to change their behaviour. Students were asked to respond as if they were talking directly to the patient. Free-text responses were prompted so that students were able to write as much or as little as they wished.

To analyse these data, a coding manual was designed to identify general communication skills and behaviour change techniques demonstrated within transcripts. The coding manual comprised two types of general communication skill (1. Active listening and empathy, 2. Patients' perspectives). These components are informed by the Calgary-Cambridge Observation Guide which is an established framework commonly used to assist medical student learning about clinical communication skills (Kurtz, 2002; Kurtz, & Silverman, 1996). This consultation model emphasises the importance eliciting patients' ideas, concerns and expectations (ICE) (Kurtz, Silverman, Benson, & Draper, 2003; Matthys et al., 2009), and recommends that health professionals interactions are patient-centred (Stewart, 2001). Within the 'gathering information' section of the Calgary-Cambridge framework it is recommended that communicators illustrate empathy and listening skills and elicit patients' ICEs (Kurtz, 2002; Kurtz, & Silverman, 1996). Thus these components, along with patient-centred skills (e.g. eliciting and using patients' perspectives to guide interactions) are reflected within the general communication skills below. These skills do not map onto all components of the underling frameworks directly because of the nature of the task given to students. Specifically, the written task does not allow for a two-way interaction with a patient and therefore the components below have been selected to correspond with the skills students are able to display within a task of this kind. The

second section of the coding manual included seven domains comprised of different behaviour change techniques corresponding to the Tent Pegs booklet used within the session (Figure 1).

One author (AC) coded the entire dataset using the manual, awarding one point for each instance in which a behaviour change technique or general communication skill was identified within a participant statement. A second coder (JH) repeated this process for 20% of the data set. Inter-rater reliability was 'outstanding' (Landis & Koch, 1977) for all nine coding manual components ($k=0.83$ for all behaviour change technique domains apart from 'changing the environment': $k=0.67$). In order to account for varying lengths of participant responses, the percentage of statements within each transcript which were coded as a communication skill (either a behaviour change technique or a general communication skills) were calculated to obtain a final score. As statements could be coded as including a behaviour change technique, a general communication skill, or both, each transcript was given three separate percentages scores relating to these skills.

3. Feasibility and acceptability

A fidelity analysis was conducted to provide an indication of feasibility. Sessions were audio-recorded to investigate the extent to which tutors adhered to the intervention protocol. Two key elements were included within this measure: adherence to timing (14 different tasks were allocated timeframes within the overall session), and depth of section coverage (each task was rated by one researcher [AC] as 'not covered', 'brief/shallow coverage', 'adequate coverage', or 'full/in depth coverage').

Regarding acceptability, an online post-intervention questionnaire was designed to assess student satisfaction with the session. Four broad questions were included: 1. What did you expect from the session and did you get it? 2. What did you like about the session? 3. What did you find least helpful

about the session? 4. What other comments or ideas do you have about lifestyle change communication and education on this topic?

These data were analysed using content analysis (Krippendorff, 2004). Initially relevant units of the data were identified; this included any text which was deemed to explicitly answer one of the four questionnaire items. In this way extraneous data could be removed from the analytic document. Highlighted data were annotated and organised into emerging codes which aimed to describe observable patterns in the data thereby inferring contextual phenomena within the dataset (Krippendorff, 2004). Finally, codes were grouped into broader themes resulting in a narrative that answers the research question and is supported by examples from the text (Krippendorff, 2004). The number of participants supporting each theme and subtheme were calculated in order to describe the proportion of the sample representing each section of the analysis. One author (AC) initially conducted this procedure on the data set. An independent coder (AD) then double coded the transcripts by mapping the data onto the proposed coding framework using a manual outlining the previously identified codes. Both coders produced lists of participants supporting each theme and subtheme. Inter-rater reliability between the two independent coders was substantial to high (in accordance with Landis & Koch, 1977) for all themes (Theme 1: $k = 0.85$, Theme 2: $k = 0.78$, Theme 3: $k = 0.89$). Remaining disagreements regarding this coding were resolved via discussion.

10.4 Results

Of 41 students who attended the lifestyle change session, 34 (82.9%) completed the TPB questionnaire and of these, 30 students (73.2%) completed the skills measure and nine (26.5%) provided feedback on the student satisfaction measure. Of the 34 students who completed at least one of the outcome measures 21 (61.8%) were female, and participants' ethnicity comprised 19

(55.9%) British, four (11.8%) Chinese and 11 (32.4%) 'other'. Mean age was 24 years (range = 22 - 28 years).

Initial analyses showed that for most quantitatively analysed variables (TPB questionnaire and communication skills measure), the data were not normally distributed. Therefore Wilcoxon signed rank tests were conducted to assess changes in student scores pre- to post-intervention.

Theory of Planned Behaviour questionnaire

Student scores increased following the education session and the associated effect sizes ranged from medium to large (Table 2).

Table 2. Students' (n=34) mean TPB questionnaire scores organised by subscales assessing individual behavioural determinants pre- and post-intervention, and results of associated Wilcoxon signed rank tests.

TPB questionnaire subscale	Mean rating (SD)		Wilcoxon Signed rank test		Effect size ($r = Z / \sqrt{N}$)
	Time 1	Time 2	Z	P value	
Intention	6.020 (.902)	6.539 (.580)	-3.847	.000	0.660
Subjective norms	5.657 (.831)	6.010 (.729)	-2.682	.007	0.460
Attitudes	5.404 (.865)	5.971 (.622)	-3.238	.001	0.555
Perceived Behavioural Control	4.882 (.917)	5.922 (.687)	-5.005	.000	0.858

Notes. Subscale scores comprise participants' mean scores on questionnaire items grouped by individual behavioural determinants. All ratings were made on 7-point likert scales. Cohen (1988) denotes that effect sizes (r) $\geq .10$ = small, $\geq .30$ = medium, $\geq .50$ = large.

Internal consistency

In order to determine the internal consistency of this measure, Cronbach's α was calculated for each TPB subscale (intention $\alpha = .910$, attitudes $\alpha = .556$, subjective norms $\alpha = .685$, PBC $\alpha = .712$). Although

adequate values usually lie above $\alpha = 0.7$ (Nunnally, 1978), for small groups of items (below ten) it is expected that acceptable alpha's will be closer to $\alpha = 0.5$ (Pallant, 2001).

Communication skills measure

The frequency of statements provided by students throughout the entire dataset (51 responses in total: 23 pre-intervention and 28 post-intervention responses) ranged from 1 to 14 statements (mean = 5.73, SD = 2.65). Due to this variability in response length, analyses for this measure were calculated using percentage scores (the number of statements coded as demonstrating skills divided by the total number of statements per transcript).

Students' mean *total skills scores* (i.e. percentage of each transcript in which behaviour change techniques or general communication skills were identified) significantly increased from 61.8% pre-intervention to 85.6% post-intervention ($z = -2.39$, $p = .017$, $r = 0.50$). In relation to each subscale, *behaviour change technique scores* alone did not increase significantly post-intervention ($p > .05$). However, the mean *general communication scores* (Active listening [ACT] and eliciting patients' perspectives [PP] combined) significantly increased from 29.6% pre-intervention to 50.4% post-intervention ($z = -2.33$, $p = .020$, $r = 0.49$).

Feasibility and acceptability measures

Descriptive statistics were used to compare the amount of time allowed for each section (Introduction; Brainstorms, Behaviour Change Techniques; and Summary) with the actual time spent delivering them. For the 'Introduction' section (25 minutes allowed), median = 23 minutes, range=18-25 minutes. For the 'Brainstorm' section (40minutes allowed), median = 23 minutes, range = 31-40 minutes. For the 'Behaviour Change Technique' section (100 minutes allowed), median = 104 minutes, range = 80–140 minutes. Finally, for the 'Summary' section (15 minutes allowed), median = 6 minutes,

range 4-13minutes. The total time allowed for the entire session was 180 minutes and the median time spent = 170 minutes (range = 140-182 minutes).

Regarding 'depth of coverage' ratings, over the five education sessions there were a maximum of 70 instances in which the 14 different session tasks could have been rated as either not covered, brief/shallow coverage, adequate coverage, full/in depth coverage. Overall, there were four instances (5.7%) in which one of the following tasks were not covered: *signposting students to the session structure, introducing and reviewing the session objectives, and discussing what students will take away from the session*. There were two instances (2.9%) in which the *review of session objectives, and helpful communication strategies* were covered briefly/shallowly. There were four instances (5.7%) in which the following four tasks were covered adequately; *introducing and reviewing session objectives, signposting students to the session structure, and communication strategies to avoid*. Thus there were 60 (85.7%) instances in which session tasks were covered fully/in depth (*including each of the 14 tasks*).

A content analysis of the acceptability data revealed three key factors indicating high student satisfaction with the session. Students reported 1) Fulfilled expectations to learn communication and behaviour change skills, 2) Wanting more formal education on the topic, and 3) Valued session format and content. Each theme and sub-theme is described with illustrative quotes from students and frequencies of participants supporting each sub-theme. Anonymous participant labels are also provided alongside quotations in parentheses.

1) Fulfilled expectations to learn communication and behaviour change skills

Six students (66.7%) had expected the education session to meet their desire to learn specifically how to communicate with patients about lifestyle change. These students agreed that the session had been able to meet this expectation.

I expected to gain insight into appropriate ways of broaching the subject of lifestyle change with a patient. This is something I definitely felt I came away from the session with. (ID2)

As well as noting that it was helpful to have learned communication based skills during the session, five students (55.6%) also reported that they learned new behaviour change facilitation skills. The emphasis here was on the session being able to give students tangible tools they could use with future patients in practice. Furthermore, students perceived that these acquired skills would be effective in helping future patients to change their behaviours.

It was pitched perfectly and gave them [medical students] the tools to help patients. (ID1)

In addition, two students (22.2%) emphasised that the Tent Pegs framework (a booklet comprising 29 individual behaviour change techniques) was the main vehicle in meeting the above expectations and was responsible for equipping students with strategies to facilitate health-related behaviour change with patients.

Expected to learn about techniques to facilitate behaviour changes in patients, definitely got this from the Tent Pegs technique. (ID9)

2) Wanting more formal education on the topic

Five students (55.6%) believed that receiving education on this topic was important and valuable to them as future doctors.

Overall an excellent session on a vital topic for day-to-day healthcare delivery; its importance should not be underestimated. (ID9)

Some students (n = 3, 33.3%) felt that there should be more formal education on this topic than there is currently within medical education, and four (44.4%) believed that it should be included as a formal and compulsory element of the medical degree rather than a voluntary session. Reasons for this included ensuring that all students with varying interests in the subject would then be provided education on this topic, and also because it would align current medical training with the GMC recommendations that graduating medical students should be able to discuss behaviour change and obesity with patients in practice (see GMC, 2009).

Think there should be more of it taught as a necessary part of course, especially as it is part of Tomorrow's Doctors. (ID3)

3) Valued session format and content

Commonly highlighted by students (n = 6, 66.7%) was that they liked the opportunity to try out and practice the behaviour change skills they had been introduced to during the session.

Role play was a good way to start to practice what we had been taught. (ID5)

Students highlighted specific factors that could improve the session. Three (33.3%) thought the session was too long, and three (33.3%) suggested a simulated patient would have been useful. Other improvements suggested by one student each (11.1%) were being given further reading on the topic, and having more time for discussion and role plays. However, the majority of students (8, 88.9%) liked various aspects of the session format and the content. Six (66.7%) liked having GP trainees delivering the session, running it in small groups, and having lots of interactivity and discussion. Six students (66.7%) enjoyed learning aspects such as the background to the topic, psychological explanations about facilitating behaviour change, and watching real patient video clips.

Provides a good framework of achievable goals in trying to attempt behavioural change.

Provides good psychological argument to aid behavioural change. (ID4)

10.5 Discussion

Results from this feasibility study suggest that theory-based behaviour change education for medical students can lead to positive changes in theoretical predictors of engaging in obesity management discussions with patients, and improvements in communication skills. Intervention delivery was consistent within this undergraduate medical programme demonstrating feasibility, and it was acceptable to students who reported high levels of satisfaction. Together these findings suggest not only that this education can be successfully implemented within an undergraduate medical programme but also that it may be effective in encouraging students to engage more often in constructive discussions with patients about obesity management.

Previous evidence suggests that a range of factors relating to medical intentions, attitudes, subjective norms, and PBC might contribute to predicting medical students' engagement in obesity management

discussions with future patients (Chisholm, Hart, Lam, et al., 2012; Litva & Peters, 2008; Ma et al., 2004). Therefore the results of this study showing that education based upon theoretically informed behaviour change techniques can improve these constructs, provides evidence for developing effective medical education in this area. It is particularly encouraging that students' PBC increased following the intervention because a lack of confidence and preparedness to discuss obesity in medical practice are issues consistently raised within the literature (Chisholm, Hart, Lam, et al., 2012; Laws et al., 2009; Thuan & Avignon, 2005). Furthermore, previous research has indicated that PBC can be difficult to improve using educational interventions, and a meta-analysis exploring the best ways to improve self-efficacy (a very similar construct) found that physical activity interventions including performance feedback produced the greatest effects (Ashford, Edmunds, & French, 2010). Although this wasn't directly explored in the present study, it can be noted that students gave substantive feedback on their peers' behaviour change communications within role plays during the session. Additionally, students themselves asked for simulated patients to be included within this session, which would provide further opportunities for feedback from both the doctors' and patients' perspective.

In addition to improving key behavioural determinants regarding discussing obesity management with patients, the intervention was also shown to improve the potential quality of those discussions by increasing students' use of effective communication skills. The significant increase in students' overall communication skills scores following the session showed that greater proportions of students' obesity management discussions involved helpful communication strategies. Investigations revealed that specific strategies used by students included active listening, empathy, and elicitation of patients' views and solutions. Effective communication is central to delivering high quality patient-centred healthcare (Kurtz et al., 2003; Matthys et al., 2009; Stewart, 2001) and positive associations have been shown between using these types of communication skills and a variety of patient

outcomes including mortality, blood pressure, anxiety and depression, adherence to medical advice/treatment, symptom resolution and functional health status (Beck, Daughtridge, & Sloane, 2002; Griffin et al., 2004; Mead & Bower, 2002). Thus, this educational intervention may be useful in promoting high quality obesity management discussions with patients with the potential to contribute towards positive health outcomes.

Despite these improvements in general communication skills, students' use of specific behaviour change techniques following the session did not change. It cannot therefore be concluded that students were more likely to employ behaviour change techniques with patients following this single session. A number of factors may account for this result. Firstly, it may be that students did not acquire behaviour change communication skills during the session. Student feedback on the session however, contradicts this as they reported learning novel communication approaches to facilitate behaviour change with patients during the session. Results of the TPB questionnaire and in particular the increases in PBC also suggest that students at least perceived that they had learned strategies to discuss obesity management with patients.

An alternative explanation may be that the communication skills measure was unable to detect acquired behaviour change skills. One reason for this might be that most students opted to complete the questionnaire immediately following the three hour session when time and commitment to complete it may have been reduced. Although we were unable to observe the difference in time spent answering both skills measures, 13 of the 21 students (61.9%) who completed both pre-and post-intervention skills measure, wrote fewer overall statements following the session than before. A final possibility is that students found it easier to express general communication skills in a written format compared to expressing use of specific behaviour change techniques. This may be particularly likely because medical students in the present sample were more familiar with conveying listening

and empathic skills (due to this being a frequent and core element of their training) than with the Tent Pegs behaviour change technique framework which introduced a new and unfamiliar vocabulary that they were expected to demonstrate competence in using. Finally, it is also important to note that this assessment was a proxy measure of general communication and behaviour change skills, and therefore may not reflect how students would actually communicate with simulated patients or in practice.

Due to the lack of a control group and small sample size, this study had insufficient power to detect systematic changes in student outcomes, and we are therefore unable to obtain robust evaluations of its efficacy. It is also noteworthy that participants volunteered to participate in this study and they may therefore represent a more motivated group of students compared to their peers. However, the preliminary evaluation of this educational intervention for medical students supports further development of an educational intervention of this kind. It not only demonstrates potential to empower students to go on to discuss obesity management with future patients but it also indicates that this education is acceptable to students and can be successfully delivered within existing undergraduate programmes. Students in this study highly valued the opportunity to learn about behaviour change and advocated further inclusion of this within their medical education. Fidelity analyses indicated that GP trainees delivered the session relatively consistently and to a high standard. This evidence contributes to the argument that non-psychologists are able to deliver behaviour change education effectively, which is a topical issue that has also been focused upon within other behaviour change intervention research (French et al., 2011).

These outcome measures are also congruent with recommendations for developing complex interventions that feasibility and acceptability, as well as potential efficacy should be investigated at early design stages (Campbell et al., 2000), and that novel medical education should allow students to

evaluate their own education to enhance self-directed learning (Swanwick, 2010). Other strengths of this study include educating medical students about theory-linked behaviour change techniques, a subject which is currently lacking in the literature (Chisholm, Hart, Mann, et al., 2012; Moser, & Stagnaro-Green, 2009), and the application of educational theory and principles to maximise the potential for student learning. As well as ensuring that theory was explicit on these two levels, this study also contributes towards evidence on understanding which aspects of the TPB may influence clinicians' behaviours (Eccles et al., 2006; Grimshaw, Eccles, Walker, & Thomas, 2002; Perkins et al., 2007). Although the present study cannot identify the mechanisms by which behavioural determinants are activated, it does suggest that theory-based behaviour change education may elicit positive changes towards encouraging medical students to engage in obesity management discussions with patients.

Section three summary

Section three has illustrated how the literature on behaviour change techniques can be transferred to medical education. The two journal articles presented in Chapters 8 and 10 describe how this can be done using research methods to systematically develop and evaluate this process within an educational intervention for medical students. These studies aimed to overcome some of the limitations of other research conducted in this area which were highlighted within Section two. Key challenges were shown to include the diverse and opportunistic nature of delivering obesity management education; variable support for including it within undergraduate medical education; and variable student engagement in the subject. Some but not all of these challenges were overcome as a result of these studies and Chapter 9 highlights the key challenges that were encountered. On the whole however, the studies and issues raised throughout this section contribute to understanding how effective obesity management education for medical students may be developed. Importantly, it provides a rationale for further development of an educational intervention of this kind.

SECTION FOUR: GENERAL DISCUSSION

Section four introduction

This section aims to summarise the key findings from the studies conducted within this thesis. These studies will be discussed in terms of their main strengths and limitations, and their implications for medical education, health psychology, and health professional practice. Logical progressions for future research will then be proposed and the section will end by considering the key conclusions of this programme of research.

Chapter 11: Contribution of thesis studies

(Thesis sub-section)

11.1 Summary of main findings

The studies presented within this thesis have broadly aimed to identify the extent to which medical students are currently prepared for managing obesity with future patients. It also aimed to investigate whether research evidence and theory can contribute towards developing effective education of this kind. These aims largely derived from the literature indicating that although doctors are expected to discuss obesity with their patients, they may be ill-equipped by medical education to do this (Chisholm, Hart, Lam, et al., 2012; GMC, 2009). Furthermore, it was unknown to what extent available evidence on behaviour change facilitation was being used to meet this educational need (e.g. Michie et al., 2011). The studies in Chapters 5 and 6 therefore reported on the presence and quality of existing empirical evaluations of obesity management education. Relevant medical education interventions were identified through systematic searches of the literature. Findings showed that they are scarce and highly susceptible to bias due to frequent insufficiency to control for possible confounding factors. It was therefore concluded that it remains unknown how to effectively prepare medical students for practice in this area. Additionally, intervention descriptions suggested that obesity management education either rarely uses behaviour change theory to guide the educational content presented to students, or that researchers fail to report this explicitly. Complementary findings from Chapter 6 also illustrated that very few theory-linked behaviour change techniques which are recognised by established taxonomies (Dixon & Johnston, 2010; Michie et al., 2011) are included within reports of these kinds of educational interventions. Thus, it seems that obesity management education for medical students has not undergone robust empirical investigation, and

that current understanding about how to support patients change health behaviours has been poorly translated to medical education research.

Given this lack of evidence on effective obesity management education for medical students, and reports from qualified health professionals that they are under-prepared by training to address issues of behaviour change with patients (Chisholm, Hart, Lam, et al., 2012), the next study in this thesis sought to explore medical educators' perceptions and experiences of implementing this education within medical schools. The results of semi-structured interviews with medical educators reported in Chapter 7 highlighted some of the key issues influencing these perceptions. Medical educators reported that overall, endorsement by the General Medical Council (GMC, 2009) was helpful in assisting the integration of obesity management education within undergraduate programmes. However, they also reported delivering obesity management education opportunistically, without a consensus on how best to do this. Furthermore, educators felt that there was little supplementary guidance to inform them about what specifically to teach to medical students. This lack of guidance, along with varied levels of support from others in their setting acted as barriers to the implementation of obesity management education within medical schools. Finally, this study also revealed that educators viewed students' variable engagement in the education as a potential challenge to successful delivery. They therefore highlighted the importance of enhancing the relevance of obesity management education to students.

As with other medical education about the behavioural and social sciences (Litva & Peters, 2008), this study emphasises the need for change in the available guidance for educators and the culture within medical education. Without this it is unlikely that the barriers to successful medical education about obesity management will be overcome. In response to the challenges identified within this study, a number of potential solutions were offered. It was suggested that educators could be guided by a

more detailed statement of core objectives of obesity management education to clarify the clinical roles expected of medical students. For example, are students expected to merely identify and refer the issue of obesity or should they engage in behaviour change management discussions with patients? It was also suggested that educators should have better access to the literature on behaviour change techniques, and use student engagement strategies to enhance successful delivery to students.

These findings subsequently informed the development of a behaviour change communication tool and educational session for medical students. This built upon the existing literature (e.g. Chisholm, Hart, Mann, et al., 2012) by drawing upon the available evidence-base on behaviour change and by using validated tools to assess meaningful student outcomes. Chapter 8 outlines the development and validation of the communication tool, and the findings showed that the behaviour change literature can be transferred for use within medical education. Specifically, it can be used to create a distinct and comprehensive communication tool for medical students. Discriminant content validity methods showed that within this tool, numerous behaviour change techniques were meaningfully mapped onto domains within a pre-defined educational framework (Tent Pegs). Despite good overall validity within this framework, findings suggested that overlap does exist between definitions of some behaviour change techniques and domains, and that minor revisions may be beneficial to improve the Tent Pegs structure (for full discussion see Chapter 8).

Chapters 9 and 10 described a pilot educational intervention which included the Tent Pegs framework to investigate the potential efficacy, acceptability and feasibility of delivering obesity management education to medical students. The intervention consisted of an educational session which addressed some of the challenges and solutions described within Chapter 7. For example, learning objectives around being able to use behaviour change strategies to support patients were shown to students,

and educators endorsed the importance of learning these skills so that the clinical roles expected of students' were clear. The behaviour change literature was used to directly inform session content (e.g. Tent Pegs) so that educators were able to use current literature in this area (Dixon & Johnston, 2010; Michie et al., 2011). Finally, student engagement was enhanced throughout by focusing the session tasks and discussions that were grounded within relevant clinical contexts. The results of this before-and-after study suggested that the educational intervention increased the likelihood that medical students will go on to discuss obesity management with their patients and that those conversations may be of higher quality (i.e. include more active listening, and displays of empathy and patient-centeredness). Although findings did not show an increase in students' use of behaviour change techniques following the intervention, it did provide evidence that the intervention could be feasibly delivered within an undergraduate medical programme and that it was acceptable and highly valued by students who took part.

11.2 Key strengths and weaknesses of studies

A number of different methodologies were used throughout these studies and there are various strengths and weaknesses relating to each one. Although the previous chapters have outlined specific methodological issues, this section will highlight those that are most likely to influence the strength of the conclusions drawn from the findings outlined above.

The systematic reviews conducted within Chapters 5 and 6 are notable for their advancement of the limited literature on obesity management education. Previous to these studies, no systematic reviews had been conducted in this area and it was therefore not possible to draw firm conclusions about what evidence is available to demonstrate effective obesity management education for medical students. These reviews were helpful in determining the quality of educational interventions in this area. Review conclusions were strengthened by the use of a standardised framework to guide their

construction (Centre for Reviews and Dissemination, 2009). This framework ensured that the research questions selected were precise and relevant (Liberati et al., 2009).

The scope of the review in Chapter 5 was however limited to including only interventions (i.e. studies reporting at least one outcome measure). Although appropriate to the research question, this may have resulted in omitting 1) published but unevaluated reports of relevant education, and 2) evaluated but unpublished reports of educational interventions. These reports might have provided additional interesting information about how obesity management is designed and delivered to medical students. Similarly, the education descriptions involving behaviour change techniques, identified within Chapter 6 were restricted to published articles and may have also overlooked relevant education descriptions within the grey and unpublished literature.

Including grey literature within reviews (i.e. information that is not controlled by commercial publishers), is helpful in providing a balanced representation of evidence because it reduces potential publication bias which may lead to overestimations of positive study results (Dickersin, 2005; Haig & Dozier, 2003). Searching for medical education literature is also acknowledged to be particularly challenging as few published sources of information are specifically dedicated to medical education as a stand-alone topic. Searches for medical education research can therefore be hampered as topics do not always map well onto database subject headings, and key words and concepts often vary between databases (Haig & Dozier, 2003; Reed et al., 2005). Evaluations of medical education may therefore be difficult to identify, and work in this area may be under-represented within published literature. This highlights a need for better recognition of medical education research as a domain, and also indicates that future systematic reviews with greater scope should include grey literature searches where possible.

Our systematic reviews may therefore have underestimated the prevalence of studies evaluating obesity management education, and overestimated the positive results of these studies due to publication bias. However, rather than investigating issues of prevalence or exploring the nature of current obesity management education in general, the studies in Chapters 5 and 6 focused more specifically on identifying evidence for effective educational interventions in this area, and also exploring behaviour change techniques used within published reports. If the aim had been to identify the prevalence or content of this education, it may have been more appropriate to conduct a survey of medical school programmes, as other similar studies have done (Garry, Diamond, & Whitley, 2002; Roddy, Rubin, & Britton, 2004).

The qualitative approach described within Chapter 7 was appropriate for the exploratory nature of this study's aim, i.e. to explore medical educators' perceptions of factors influencing the inclusion and delivery of obesity management education. Qualitative methods are increasingly recognised for their ability to unravel some of the complexities around healthcare communication, primarily because they allow for the exploration of subject matters which are ill defined or not well understood (Britten, 2011; Kennedy & Lingard, 2006; Malterud, 2001). A further strength of this study was its use of grounded theory principles (Strauss & Corbin, 1998), which facilitated the identification of unexpected and novel issues that educators encounter when implementing this education within medical schools. These insights exposed the challenges to implementation and informed suggestions for potential solutions. Grounded theory principles in particular are said to offer a systematic approach to conducting qualitative research which reduces the potential bias associated with more subjective research processes (Kennedy & Lingard, 2006).

On the other hand, a main limitation of this study relates to the difficulty described within Chapter 7 regarding recruitment. Accessing appropriate individuals with relevant experiences and views was

challenging and this suggests that others with more relevant views may not have been included within this analysis. However, participants represented 23 different UK and Irish medical schools, held different educational roles and trained in various clinical specialties/disciplines. Given this diverse sample, it is likely that individuals with wide ranging views were included within the study and consequently that issues were raised that were relevant to many educators within different UK and Irish medical schools.

Finally, the strengths and weaknesses involved in designing and developing the educational intervention reported within Chapters 8, 9 and 10 are discussed. Firstly, although the Tent Pegs framework may require minor structural modifications (see Chapter 8), this is the first study to provide a detailed example of how behaviour change research can be used to inform a communication tool to assist medical students support future patients with changing unhealthy behaviours. Support for this is demonstrated by the description of its development within Chapter 8 (i.e. showing 'how' this can be done), and evidence that the tool was acceptable in Chapter 9, which indicates its potential value to medical students.

Secondly, a key strength of the educational intervention as a whole is that it has drawn upon various theoretical frameworks to inform its delivery, content and evaluation. Underuse of theory is often noted as problematic, as it prevents replication or identification of effective interventions, and this has been specifically noted within the obesity management literature (Hardeman, Griffin, Johnston, Kinmonth, & Wareham, 2000). The present intervention was based upon theoretical frameworks at several levels (see Chapters 9 & 10). Principles of education theory were used to design the delivery of the session to students and thus optimise learning. The session content also drew upon theories of behaviour change to provide students with theory-linked behaviour change techniques that they can

use with patients in practice. This is particularly important because previous research has been criticised for failing to include theory in this way (Chisholm, Hart, Mann, et al., 2012).

Finally, medical students' behavioural intentions to engage in obesity management discussions were measured by intervention outcomes based upon the theory of planned behaviour (Ajzen, 1985; Francis et al., 2004). This allowed for the investigation of variables that were salient and relevant to the study's context: medical students' attitudes, social norms, perceived behavioural control and intentions regarding obesity management (see Chapter 9 for discussion on how the intervention targeted these constructs). Atheoretical or unclearly reported interventions that do not explicitly target behavioural determinants make it difficult to identify the active ingredients involved. Thus it is a key strength of this intervention that future replications and evaluations of it will be able to test specific behavioural determinants identified within it.

Despite these strengths, there are also a number of weaknesses that should be considered when interpreting the intervention study results. The lack of experimental control within the intervention (e.g. no inclusion of a control group, randomisation, or power statistics) may have allowed confounding factors to influence the results. For example, the extent to which findings were influenced by attendance to the intervention, rather than students' usual education is unknown. Additionally, it is well established that smaller samples are associated with increased risk of type II error, and therefore this study may not have been powered to detect the true effect of the intervention using the outcome measures (Freiman, Chalmers, Smith, & Kuebler, 1978). Clearly, a more robust empirical evaluation is required to test the efficacy of the intervention and this was a key criticism of earlier work in this area (Chisholm, Hart, Mann, et al., 2012). However, it is acknowledged that conducting large randomised controlled trials (RCTs) for educational interventions is problematic due to the existence of numerous variables which are hard to control for and likely to influence research results (Norman, 2003). Tutor differences, variations between educational sites, and ill-

defined intervention content, are all known to limit how consistently interventions can be delivered and due to this, the insights that can be drawn from such trials have often been marginal (Norman, 2003). It may therefore be more helpful to conduct smaller more easily controlled experiments with the potential to generate greater insights. However others argue that despite these difficulties it is possible to conduct RCTs for educational interventions and that education researchers have succeeded in doing so in the past (Torgerson, & Torgerson, 2001).

Although there is debate regarding the utility of conducting RCTs within medical education, the present research focused upon earlier stages of intervention development, in line with complex intervention guidelines. Specifically, it is recommended that studies early in development focus upon piloting and feasibility to enhance confidence that the intervention will be delivered as intended within larger subsequent evaluations of its efficacy (Medical Research Council, 2008). Thus it can be argued that the outcomes used in the present intervention were appropriate for this novel pilot study.

As well as obtaining helpful information about feasibility and acceptability, piloting also allowed for a number of quantitative measures of intervention efficacy to be tested. One issue uncovered through this study was that the skills measure may not have performed as intended (see Chapter 10).

Although it is possible that the behaviour change techniques used did not increase post-intervention because students did not learn the necessary skills, this contradicts reports from students that they learned new behaviour change communication strategies. Thus, it may be that students were unable to convey these skills in the written format asked of them. It is also possible that fatigue immediately following the 3-hour session influenced the effort that students exerted filling out the post-intervention outcome measure. These conflicting results suggest that further development of this measure may be required.

Another potential disadvantage of the study was that the sample was self-selected and may therefore have represented a more enthusiastic group compared to their peers. This is acknowledged to occur with voluntary training for qualified healthcare professionals (Salmon et al., 2007), and thus may have caused an overestimation of the potential impact of this intervention. Other medical students may not have engaged as well with the session and may therefore have demonstrated less improvement in communication skills or behavioural intention than was reported in Chapter 10. However, if included students were more enthusiastic than their peers it may alternatively be that pre-intervention scores were higher than would be expected of equivalent non-participants. This may have led to underestimation of the improvement in skills and behavioural intentions, as ceiling effects could have influenced the results. These possible influences upon the present results should be taken into consideration when interpreting the results; however, this also demonstrates the importance of future work prioritising the need to recruit a more representative group of medical students.

Another potential limitation of the intervention is that although the overarching aim of this education was to better prepare medical students for discussing obesity with patients, patient outcomes were not tested. This deserves particular consideration as patient outcomes are increasingly highly valued within medical education research, with some authors implying that without consideration of medical education end-points (i.e. patient health), it is not possible to fully determine what optimal education is (Chen, Bauchner, & Burstin, 2004; Dauphinee, 2012; Prystowsky & Bordage, 2001). However other researchers have warned that over-reliance on outcomes research is unhelpful and sometimes inappropriate (Cook & West, 2013). Cook and West (2012) identify a number of reasons why patient outcomes may not be appropriate within the context of evaluating medical education interventions.

One issue is dilution, which suggests that the impact of an intervention is reduced when the outcome measure is more distant from the intervention. Thus the impact of an intervention will be harder to

detect if a study on medical students (rather than qualified doctors) aims to detect change in patient morbidity/mortality. This is because there are many more influences upon clinician behaviour that will occur between medical school and finally practicing as a qualified doctor in healthcare settings. Furthermore, there will be many other influences on patient outcomes in addition to clinician behaviour (e.g. other interactions with the clinicians or healthcare services, and patient characteristics and other related variables).

In order to minimise the effects of dilution, the intervention would require a very strong impact or a very large sample size (Cook & West, 2013). Both however, are unlikely to be achievable within undergraduate education contexts as a very strong intervention which is multi-disciplinary and multi-faceted but unfeasible may be required; or thousands of medical students to formulate a sample size large enough to provide adequate power to detect intervention-associated changes in patient outcomes would be needed (Cook & West, 2013). Cook and West (2012) also point out that measures of skills, attitudes and satisfaction should not be underestimated as they can be important, especially within theory-building research which aims to determine factors underlying clinician behaviour.

In this case, it was helpful to determine students' communication skills and their behavioural intentions regarding obesity management discussions with patients. These measures align much more closely with the point of intervention (i.e. medical school) and may therefore be more appropriate. Further support for this argument lies within Kirkpatrick's (1959) established training evaluation model. This endorses measuring various relevant constructs in addition to patient outcomes, for example, reaction (satisfaction), learning (knowledge, skills, and attitudes), and behaviours in practice (see Cook & West, 2013). Specifically relevant to the context of measuring medical student outcomes related to patient obesity, a recently developed scale has also been used

to investigate salient attitudes (Ip et al., 2012). Together this indicates growing recognition that measures other than patient outcomes should be considered within evaluations of medical education.

Finally, this intervention also needs to be considered in terms of the challenges encountered regarding its implementation within the undergraduate medical programme. It is clear from the present results that there are a number of barriers both to integrating this education within undergraduate programmes (see Chapter 7) and to evaluating it empirically (see Chapter 10). Together these chapters illustrate that obesity management education can be constrained by varied levels of support for its integration within medical schools, and varied levels of student engagement in the subject and also in research participation. Other research has also identified that medical student participation rates in research are low and that a major limitation to this field is its inability to obtain adequate sample sizes (Collins, 2006; Forester, & McWhorter, 2005). Medical students report apathy and perceived lack of time to participate in medical education research, and believe there are few personal benefits to taking part (Forester & McWhorter, 2005). Although these barriers pose particular challenges for medical education researchers, it is likely that with greater scope and resources, and with awareness of these key challenges, it may be possible to overcome some of these issues. This would not only benefit integration within medical schools, but may also support more methodologically robust evaluations of this medical education.

11.3 Implications of the studies' findings

The findings of the present thesis have a number of implications that may stimulate progress within medical education, health psychology, and health professional practice. The success demonstrated by the development of the Tent Pegs behaviour change communication tool and education session supports the argument that medical educators and researchers should draw upon the available behaviour change literature. As research has shown that today's health professionals often

experience confusion regarding their responsibilities in facilitating behaviour change (Chisholm, Hart, Lam, et al., 2012; Elwell, Povey, Grogan, Allen, & Prestwich, 2013), this may reduce ambiguity about future doctors' roles in practice. It may also empower medical educators who are unaware of cutting-edge understanding about behaviour change facilitation and guide them in the development of new medical education in this area. A number of challenges highlighted within Chapter 7 may also be addressed by 1) encouraging better transfer of behaviour change science to medical education, and 2) identifying the most effective educational interventions in this area. Along with providing clarity about clinicians' roles, this may provide concrete examples of evidence-based education for educators, and enhance support for its integration within medical schools. All these influences may result in medical students who are more confident and better prepared for practice, especially in terms of discussing obesity-related behaviour change with patients.

The findings have also contributed to our understanding of why doctors may find it difficult to discuss obesity and obesity-related behaviours with patients (Haynes & Cook, 2009; Ma, Urizar, Alehegn, & Stafford, 2004). The present research suggests that doctors may be under-prepared by medical training, and that their intentions, attitudes, confidence, and communication skills may be improved through undergraduate education aiming to equip students with behaviour change facilitation skills. This indicates a role for health psychologists to provide behaviour change training within healthcare systems, and particularly within medical education. During the present programme of research, it has been demonstrated that it is feasible for health psychologists to deliver tutor training to doctors, and for doctors to deliver the subsequent education to medical students. One particular advantage of this is that by including health psychologists within the training model, the intervention content can be informed by relevant theory and this can be retained through to intervention delivery. The results within Chapter 9 regarding intervention fidelity support this. Thus, it might be that health psychologists have a role in training trainers as well as being able to deliver behaviour change

education directly to recipients. It is however, an empirical question whether it is more beneficial for health psychologists or doctors to deliver this education to medical students, or indeed, to deliver this to other health professionals.

Also of benefit to health psychology as a field of research is the contribution this thesis makes to the evidence base on behaviour change techniques. This work has demonstrated that theory-linked behaviour change techniques can be applied in an educational setting. Specifically, it has been shown that available taxonomies can be transformed into communication tools for medical students. This adds to the growing literature in this area illustrating numerous possible applications of behaviour change theory and research. For example, Abraham and Michie's (2008) behaviour change technique taxonomy has been used in the training of NHS health trainers to reduce obesity-related behaviours amongst deprived populations (Gardner, Cane, Rumsey, & Michie, 2012). These techniques have also been used to enhance participation in genetic counselling about breast cancer (Albada, Van Dulmen, Otten, Bensing, & Ausems, 2009) and improve physical activity amongst adolescents (Araujo-Soares, McIntyre, MacLennan, & Sniehotta, 2009). However, this is the first study to have demonstrated an application of the refined CALO-RE taxonomy (Michie et al., 2011) to a medical education intervention. Thus, this work supports future applications of this taxonomy to similar medical education settings.

This thesis may therefore have broader practical implications in terms of developing education for health professionals. This work could inform new training programmes for doctors, nurses, healthcare assistants and other healthcare professionals who require support facilitating behaviour change with patients in practice. This corresponds with clinical guidelines that expect various healthcare professionals to take opportunities to facilitate behaviour change with patients (NICE, 2007). The Tent Pegs framework is a comprehensive tool designed for use with patients and may therefore be easily integrated into healthcare practice, to aid clinical communication about behaviour change. Thus, this

work may assist in meeting an educational need for various healthcare professionals. Given that medical education may influence subsequent healthcare delivery (Kalet et al., 2010), it may be that the results of this thesis also have implications for medical practice. If doctors are better prepared by education to discuss obesity-related behaviour change, this may result in more constructive doctor-patient interactions. Although it is beyond the scope of the present thesis, it is important for research to investigate how patients' behaviour and health are influenced by more or less constructive behaviour change discussions.

11.4 Future research

A number of unanswered questions are raised by the present research findings and point to suggestions for future work. A key role for future research is to continue with the development of an educational intervention for medical students concerning obesity management. Initial findings suggest that the intervention is feasible, acceptable and may increase some communication skills and behavioural intentions in students (Chapter 10). These findings can be used as evidence to support the rationale for developing a more robust evaluation of its efficacy and effectiveness. Another consideration for future work is that behaviour change literature has often focused upon short term behaviour change and this is recognised by national guidelines in the area (NICE, 2007). In order to improve these behaviour change guidelines for health professionals, evidence identifying interventions achieving long term behaviour change is required. In line with the present research it would therefore be particularly helpful for evaluations of this intervention to consider how to measure skills acquisition (i.e. behaviour change facilitation skills) of medical students over time. If this work were extended further and applied to interventions targeting qualified doctors it would also be beneficial to measure patients' behaviour change over time as well.

Beyond identifying effective educational interventions in this area, findings from Chapter 7 also highlight the need to actively address the barriers to implementing obesity management education within medical schools. This study suggests that future research should tackle inconsistencies regarding how obesity management education is delivered, encourage support for its inclusion within undergraduate education, and enhance student engagement in the topic where possible. Research demonstrating how to succeed in overcoming some of these issues is needed and would support the integration of effective educational interventions in this area.

Another question raised by the present research relates to whether or not behaviour change education can prepare medical students for discussing health behaviours with patients other than those related to obesity. This thesis has focused upon obesity as an example of a topical and important health issue which requires investigation (Finucane et al., 2011). However, behaviour change education is often viewed as multi-faceted comprising a range of health behaviours (Moser & Stagnaro-Green, 2009). Some research suggests that obesity-related behaviours are qualitatively different to other health behaviours and are predicted by different contexts and should therefore be tackled in different ways. For example, it has been argued that eating and physical activity patterns are both unstable behaviours compared to alcohol and smoking which can be seen as more stable (Lawrence & Ferguson, 2012). However, further research is needed to determine whether there are differences regarding the impact of behaviour change education upon medical students' ability to discuss different health behaviours with patients.

11.5 Final conclusions

The aim of the work presented in this thesis was to investigate the quality of current obesity management education for medical students. Despite the growing evidence base for theory-linked behaviour change techniques, it is apparent that this literature has not been adequately applied to education that prepares future doctors for medical practice. There are also important challenges for medical educators that need to be addressed in order to successfully integrate obesity management education into undergraduate medical programmes. However, it is possible to create medical education which is based upon behaviour change science. Moreover, this education can be successfully delivered within undergraduate medical education and is acceptable to students. It may also increase students' communication skills and intentions to discuss obesity with their future patients. Overall, this programme of research has added evidence to demonstrate the utility of behaviour change science to medical education and provides support for the continuation of research aiming to develop effective education for medical students in this area.

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Appendices

Appendices A-G are displayed here.
Appendix H is included as a non-written attachment.

Appendix A: Response to reviewers' comments (Chapter 6)

Response to reviewers' comments

The journal article in Chapter 6 was submitted to the British Journal of Health Psychology but was not accepted for publication. Reviewers raised a number of key issues within the paper and these are displayed below. Considered responses to these comments are provided in order to acknowledge the study's key flaws, address reviewers' points and consider how some of these issues may be resolved.

Reviewer comments	Author's response
<p>Both reviewers expressed confusion about what the intended target population and target behaviour was for the behaviour change studies included within the review. This confusion is explained in further detail within Reviewer 1's general comments and Reviewer 2's comments 1 to 3 (see below).</p>	<p>Upon reflection, it is evident that the target population and target behaviour was not specified clearly enough throughout the paper. The reviewers rightly point out that the studies included within this review are described as educational interventions, and accordingly their target population and behaviours should have been defined.</p> <p>However, in line with the defined inclusion/exclusion criteria (Figure 1), included studies did not have to contain outcome measures within their designs. In other words, descriptive studies that outlined the educational content of a proposed intervention were included as well as intervention studies which included measures of evaluation.</p> <p>Thus the use of the term <i>educational interventions</i> may have been unhelpful here in indicating the type of articles examined within this study. A more accurate phrase may have been <i>education content descriptions</i> (including both descriptive and intervention studies).</p> <p>Regardless of this use of language, it is agreed that the focus of the paper requires further clarity. The intended target population for this study was <i>patients</i> and the target behaviour was <i>obesity-related health behaviour</i>. This aligns with Reviewer 1's option (a) (see Appendix A) because the education content of interest was the behaviour change techniques used as methods to change patients' behaviours. We did not investigate behaviour change techniques used to encourage change in medical/nursing students' behaviour in this study. Our inclusion/exclusion criteria imply this but don't state this explicitly (i.e. Figure 1 states that articles will be excluded if they focus upon changing students' health with no reference to patients' health). Therefore it is likely that this issue could be resolved by changing the language used to describe these studies, and by being explicit about the population and behaviour of interest.</p>
<p>Reviewer 1 comments that the way in which the evidence about theory and behaviour change techniques was described in the paper was problematic. They suggest toning down the arguments made regarding what constitutes effective or ineffective</p>	<p>Although evidence supporting these points is presented in the paper (e.g. Kok, van den Borne, & Mullen, 1997; Taylor, Conner, & Lawton, 2012), it is recognised that these statements are over-simplifications of a more complex literature. Regarding the evaluation of theory-based interventions, Reviewer 1 highlighted that inadequate use of theory, for example by reporting inaccurate or unclear descriptions of theoretical application, can prevent accurate interpretations of these interventions (see, Michie & Prestwich, 2010). Furthermore, research suggests that intervention efficacy is not associated with higher numbers of theory-congruent behaviour change techniques within them and that for obesity-</p>

<p>behaviour change interventions (e.g. theory-based versus atheoretical interventions; and fear tactics being ineffective).</p>	<p>related interventions, techniques linked with Control Theory may be more effective than those linked with other theories (Dombrowski, et al. 2012). These issues indicate a more complex picture than was reported in the present study regarding the comparative efficacy of theory- versus non-theory based interventions. Thus, it is agreed that these points would be improved by presenting a more balanced argument by acknowledging these additional factors.</p>
<p>The use of the term <i>theory-based</i> behaviour change techniques in this paper was questioned by the reviewers. This is because within the literature, many behaviour change techniques align with one or more theories but they are often not based upon theory explicitly (Abraham & Michie, 2008)</p>	<p>Again it is acknowledged that this issue is conflated with inadequate descriptions of behaviour change interventions and the theories that underlie them. This is an important issue and researchers in this area have therefore referred to these techniques as theory-linked, or theory-congruent rather than theory-based (Abraham & Michie, 2008; Dombrowski, et al. 2012). It is therefore agreed that this phrasing should be reconsidered in line with the above suggestions.</p>
<p>The reviewers raised that within the results section, behaviour change techniques had seemingly been coded too easily and were not in line with the CALO-RE definitions (Michie et al., 2011).</p>	<p>Whilst recognising that some codes may not have been supported by sufficient evidence, all final coding decisions were double coded and discrepancies were resolved through discussion within the research group. Although this enhanced the reliability of the analysis, upon reflection it is acknowledged that the evidence for the presence of ‘barrier identification’ was weaker than other behaviour change techniques. This coincides with both reviewers who point out that the illustrative quote in Table 2 does not indicate that this technique was used as educational content for students. It may therefore be beneficial to revise the assumption made during analysis that information described within ‘intervention descriptions’ of articles would indicate what was delivered to students.</p> <p>However, other reviewer comments suggested that it was inappropriate to code ‘motivational interviewing’ when descriptions only presented the technique label, and thus no further detail about how the technique was delivered within the intervention. To enhance coder reliability, we chose to include evidence for techniques in this way and trust that the associated technique was delivered to participants. As it was not possible to determine the consistency of behaviour change technique delivery within the different educational descriptions, and due to the overall low number of techniques included in interventions it was judged more appropriate to overestimate the presence of different behaviour change techniques within this group of studies than risk underestimating this.</p> <p>This should however, be more clearly acknowledged within the paper and it is important that future research identifies clearer criteria for coding the different behaviour change techniques that are described within developing taxonomies (e.g. Michie et al., 2011).</p>

Full comments from reviewers 1 and 2:

Reviewer #1

General comments

The current paper examines the content of obesity management education for medical and nursing students in terms of behaviour change techniques (BCTs). The scrutiny of behaviour change techniques in medical education is a worthwhile endeavour given that the vast majority of this population will become the deliverer of interventions and service which will include a substantial proportion of behaviour change practice.

However, in its current state, there remains a little confusion for me as to what was specifically examined in terms of BCTs. The authors state that they examine BCTs "used within educational interventions" (p.6). BCTs usually have a specific target population (i.e. who is intended to change) and the target behaviour (i.e. what behaviour is going to change). Both, target population and behaviour of the educational interventions in the current review is unclear to me. BCTs might be

- taught to students for information (i.e. target population: patients, target behaviour: obesity related behaviours),
- used to change students' practice behaviour (target population: students; target behaviour: behaviour change practice provision)
- used to change students own obesity related behaviour (target population: students; target behaviour: obesity related behaviours)

To illustrate this point we might consider Motivational Interviewing (MI) which is being taught to students. There are three possible ways for this to happen:

- MI is taught for information as a BCT (or package of BCTs as the authors rightly point out) to change patient behaviour and students are informed about it,
- It might be used as a BCT to influence students' practice provision behaviour (e.g. a motivational interview is carried out regarding engaging in behaviour change practice),
- MI as a behaviour change method might be taught using BCTs such as for example demonstrating/modelling the MI practice behaviours, prompting practice of MI, providing feedback on performance.

I have currently no clear understanding in which of the proposed three manners the taxonomy has been used (or if it is used differently, in which way the authors have used it). If BCTs have been applied broadly, then it might be beneficial to make this explicit in the manuscript and report on the different target populations and behaviours.

Specific comments:

Title:

- Should the title include the word 'systematic review'?

Introduction

- The authors claim that "most effective behaviour change interventions are theory-based" (p.2). Please note that this is not a universal finding in the literature (see below references)

Dombrowski, S. U., Snihotta, F. F., Avenell, A., MacLennan, G., & Araujo-Soares, V. (2012). Identifying active ingredients in complex behavioural interventions for obese adults with obesity-related co-morbidities or additional risk factors for co-morbidities: A systematic review. *Health Psychology Review*, 6, 7-32.

Gardner, B., Wardle, J., Poston, L., & Croker, H. (2011). Changing diet and physical activity to reduce gestational weight gain: a meta-analysis. *Obesity Reviews*, 12, e602-e620.

This might be related to the way in which theory has been used, and the reporting of theory use might not necessarily indicate adequate theory use, or indeed the use of an adequate theory (see Michie, S. and A. Prestwich "Are Interventions Theory-Based? Development of a Theory Coding Scheme." *Health Psychology* 29(1): 1-8.).

3. The authors claim that certain strategies are not likely to lead to behaviour change (p.2, bottom paragraph). This is a strong claim which should be toned down a little. Techniques such as financial incentives or fear appeals can, in certain context, lead to effective behavioural changes, although this might vary depending on factors such as population, context and other BCTs being used.

4. The argument "these strategies don't recognise the importance of tailoring interventions to individuals" (p.2/3) is difficult to follow. Tailoring is a way of delivering the strategy, BCTs at the level described in taxonomies have the inherent potential of tailoring.

5. The authors refer to "theory-based BCTs" throughout the manuscript and in the title. Technically this is not entirely accurate as BCTs, as described in taxonomies, are in most cases not based on theory or derived from theory, but rather in line or congruent with theory. Most BCTs are based on and derived from behaviour change practice, rather than theory. The CALO-RE taxonomy which the authors use does not link BCTs and theory, although attempts to link theory and construct domains with BCTs have been made in the past (see Abraham, & Michie, 2008). "A taxonomy of behaviour change techniques used in interventions." *Health Psychology* 27(3): 379-387.; Michie, S., M. Johnston, et al. (2008). "From theory to intervention: mapping theoretically derived behavioural determinants to behaviour change techniques." *Applied Psychology: An International Review* 57(4): 660-680.).

6. "This study therefore aimed to assess that extent to which theory-based BCTs are used within educational interventions on obesity management for medical and nursing students." (p.5/6). The word 'use' in this sentence is ambiguous to me and relates to my above comment on target populations and behaviours.

7. The authors devote a section to the behaviour change practice barriers within the introduction which is well written and informative. However, I wonder whether there are too many issues that the authors are raising in the introduction which are not necessarily addressed in the dataset of the current review. One question which I think this review can examine is "what BCTs are being taught to medical students?". Minimal exposure to evidence-based behaviour change techniques during training (both in number and time taught within the overall training curriculum) is indeed a problem and a worthwhile finding in itself. The question how to overcome specific barriers to behaviour change practice provision and increase best practice in this area seems to be slightly beyond the scope of the current review. If the authors agree, then it might be possible to focus the introduction more on the aim of the current review.

Methods

8. As the references of the review on which the current dataset is based are (rightly) removed I am unable to judge the search strategy of studies.

9. Could the authors please cross check the number of BCTs in the CALO-RE taxonomy? I was under the impression there are 40 BCTs, not 41.

10. "If authors of the articles explicitly referred to content matching taxonomy descriptions" (p.8). The phrase 'taxonomy descriptions' is slightly confusing. Do the authors mean 'BCT definitions'?

11. "To identify the exact location of BCTs, coders noted page numbers and associated quotes from within articles as evidence of each technique." (p.8) The authors should be commended for this. I believe the reporting of evidence for BCT ratings taken from used sources should become standard

practice in the future. If the journal allows it, it might be good to submit this information in addition as an online supplement table.

12. "In addition to the main analysis, descriptive information including [?] theory informing the intervention was extracted from included articles in order to describe the sample" (p.8). It might be helpful if the authors used a standard term for the educational content. Intervention might not be the best term when referring to BCTs within the educational sessions.

13. Two comments to the example BCT codings in Table 2:

a. Barrier identification: the example seems to refer to an explanation of the HBM, rather than a BCT.

b. Self-monitoring: the self-monitoring aspect seems a little unclear in the provided example. Reflecting on behaviours does not necessarily imply self-monitoring.

If the authors have adjusted some of the CALO-RE definitions it might be good to report this in the manuscript.

Discussion

14. "Other taxonomies have also been developed which identify an even wider range of techniques and behaviour change competencies health professionals should possess" (p.11). The authors should make sure not to mix BCTs (content of behaviour change practice and interventions) with competencies (the ability to deliver BCTs). These two are obviously related, but distinct. I believe the current review examines BCT content of education programmes, rather than the competencies taught to deliver BCTs. It is however true that the cited competency framework includes a list of BCTs larger than CALO-RE.

15. In addition to their explanations as to why only seven BCTs were identified in medical training programmes the authors might also want to comment on the relative behaviour change expertise required in order to develop and teach these programmes.

16. The authors identify the problem of overlap between BCTs. Indeed, there will always be an overlap between communications training and MI, as MI is heavily based around the core skills of OARS (open-ended questions, affirmations, reflections and summaries) which are communication skills. However, communication skills generally go beyond these core skills describes as part of MI, and MI includes more than just communication skills. As these packages not only overlap but also contain distinct elements it would be advisable to rate these as separate techniques. However, more guidance might be necessary in the definitions to make the rating of either or both clearer.

17. The authors continually refer to the Michie et al (2011) taxonomy. As the taxonomy has been named CALO-RE it might be advisable to use that label throughout.

Reviewer #2

This paper addresses the important issue of specification of interventions in terms of Behaviour Change Techniques (BCTs). This is a current topic generating considerable interest in the literatures in health psychology and in the design and reporting of complex interventions. The paper reports a systematic review of educational interventions for obesity management, delivered to medical and nursing students. The interventions are coded into BCTs using an appropriate taxonomy and the conclusion is that there is a need for improvement in the reporting of BCTs in educational interventions for obesity management.

I have some serious concerns about the approach and methods used in this study and I am sorry that I cannot recommend it for publication in its current form.

1. There appear to be two main arguments in the paper and these arguments seem to merge into one, with associated lack of clarity. The question of whether an intervention is theory-based is related to, but not the same as, whether the intervention is built from evidence-based BCTs - or indeed, whether it is built from BCTs that may not have a robust evidence base but which are worthy of empirical evaluation. Further clarity is needed about these ideas.
2. There is a fundamental confusion about whether the term "educational interventions for health professionals" refers to education of the health professional (eg focusing on the communication behaviours of the health professional) or whether it refers to developing skills so that the health professional can support the patient to change obesity-related behaviour (eg self-monitoring and action planning to increase physical activity).
3. Hence, it is unclear, throughout the review, who is the target population and what is the target behaviour. There appears to be a mix of target behaviours and target populations: for example, asking open versus closed questions (performed by healthcare staff); motivational interviewing (performed by healthcare staff); weight management (performed by patients). It is highly unlikely that it is appropriate, in the one systematic review, to mix up target populations and behaviours in this way.
4. Table 2 gives examples of the coding of excerpts from intervention descriptions. The examples make me doubt the validity of the coding process. Just a few examples:
 - a. BCT labels appear to be uncritically applied if the labels (without elaboration) are used in the text: "We chose to build new course around Motivational interviewing" is coded as 'motivational interviewing' even though no further detail is provided;
 - b. "At the module's end, a summary print-out is created of the student's self-written health plan" is coded as 'self-monitoring'. However, planning and self-monitoring are different BCTs;
 - c. "The Health Belief Model maintains that the likelihood of taking a recommended preventive action depends on multiple factors, including?perceived barriers to taking action, and the threat of disease" is coded as 'barrier identification' - even though the text describes a theoretical model rather than the intervention content.
5. On page 4, the authors appear to confuse BCTs and behaviour change competencies, treating them as interchangeable concepts.
6. I am wondering how the criterion for article inclusion has influenced the study conclusions: studies "were required to include a description of relevant education describing at least one BCT consistent with Michie et al's (2011) taxonomy definitions". Hence, papers that did not describe their intervention in terms of at least one BCT in that taxonomy were excluded. This appears to bias the answer to the study objective, "To identify the extent to which theory-based behaviour change techniques (BCTs) are used within obesity management education".
7. A conclusion of the study is that BCT definitions could be improved. It likely that the more recent BCT taxonomy work addresses this problem (<http://www.implementationscience.com/content/pdf/1748-5908-6-10.pdf>), and so unfortunately this conclusion would potentially be out of date before it reached publication.

Appendix B: Questionnaire items - Theory of Planned Behaviour constructs (Chapter 9)

Development of the outcome measures using the ReBEQUI manual explained **(based on Francis et al., 2004)**

CONCEPT DEFINITIONS

Define the population of interest:

Medical students in Manchester

Decide how best to select a representative sample from this population:

Identify the most appropriate cohort for the study (5th and 4th year students at Manchester medical school). These students are preparing to enter medical practice and because of this the issues focused on by this study will become most relevant to them at this point.

Define the behaviour under study using Target Action Context Time (TACT) so that all measures within the questionnaire are measuring a defined behaviour at the same level of specificity/generality:

Target – Medical students

Action – Engagement in constructive obesity management discussions with obese patients

Context – Within medical practice

Time – When qualified as doctors

This should allow the creation of an introductory statement at the beginning of the questionnaire:

We are conducting a study of [medical students] in [Manchester]. We are interested in why [medical students] do or do not go onto [discuss lifestyle change] with [obese patients]. We would appreciate your responses to some questions about this. There are no right or wrong answers. Please tell us what you really think.

A note on the development of indirect items in this questionnaire:

The guidelines recommend conducting an elicitation study to identify commonly held beliefs shared by the target population (using a sample of around 25 individuals) for the following TPB questionnaire

components: attitudes, subjective norms and perceived behavioural control (Francis, et al., 2004). For this study this stage has not been carried out using direct questions mapped onto each TPB construct. Instead, previous research conducted in this area has been used to highlight underlying factors that influence whether or not doctors engage in behaviour change discussions with patients (Bruce & Burnett, 1991; Chisholm, Hart, Lam, et al., 2012; Galuska, Will, Serdula, & Ford, 1999; Litva & Peters, 2008; Ma, Urizar, Alehegn, & Stafford, 2004). In particular, the study previously conducted by the authors of this thesis identified relevant factors which arose spontaneously within interviews with medical professionals and trainees (n=29) (Chisholm, Hart, Lam, et al., 2012). Thus these factors have been mapped retrospectively onto each TPB concept, and used here to inform the indirect measures within this questionnaire.

INTENTIONS

Decide how best to measure intentions. There are 3 ways to write intention items - intention performance (when it is possible to observe actual behaviour); generalised intention (using 3 items with high response consistency); intention simulation (written scenarios of real situations which prompt responses regarding intention to do the behaviour):

Generalised intention fits best with our defined behaviour as we do not have the opportunity to measure performance, and the conventional 'yes/no' answers to written scenarios do not fit well with the nature of discussing behaviour change as it is multifactorial, involving many different components (such as the different behaviour change techniques; BCTs). However, we have included written scenarios with free-text responses as a proxy behavioural measure (see 'Behaviour section' below) that may complement the following intention measure and will be interesting to compare analytically. Although the following three items measure intention in different ways, including intention, self-prediction and desire, literature shows they have high response consistency (see, Armitage & Conner, 2001).

I intend to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I expect to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I want to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Define how to score intention: Calculate the mean of the three intention scores

ATTITUDES

Direct measurement of attitudes

The ReBEQUI manual (Francis, et al., 2004) and Ajzen (2002) recommend including including instrumental (valuable, harmful, important) and experiential (pleasant, satisfying, enjoyable) items as well as a global item capturing an overall evaluation (negative-positive).

Discussing ways to adopt healthier lifestyles with obese patients is likely to be:

Negative 1 2 3 4 5 6 7 Positive

Important 1 2 3 4 5 6 7 Unimportant

Worthless 1 2 3 4 5 6 7 Valuable

Uncomfortable 1 2 3 4 5 6 7 Comfortable

Define how to score direct attitudes: Recode the items that have negatively worded endpoints on the RIGHT so that higher numbers reflect a positive attitude to target behaviour. Calculate the mean of the item scores to give an overall attitude score.

Indirect measurement of attitudes

Behavioural beliefs and outcome evaluations regarding the advantages and disadvantages of engaging in a specified behaviour are said to make up indirect factors influencing this construct. The qualitative study we conducted indicated factors relating to the advantages and disadvantages of engaging in the target behaviour (discussing obesity management with patients) (Chisholm, Hart, Lam, et al., 2012). Advantages included fulfilling the following: carrying out an important part of their role as a doctor, supporting improvements in patients' health, reducing workload; and a specific disadvantage was identified as potentially damaging the doctor-patient relationship.

Behavioural beliefs:

By engaging in behaviour change discussions with obese patients, I am carrying out an important part of my role as a doctor

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

By taking opportunities to discuss lifestyle change with obese patients, their health is likely to improve

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

If I discuss lifestyle change with obese patients they are less likely to return to the healthcare system in need of care in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Discussing ways to change aspects of one's lifestyle with obese patients' is likely to damage the doctor-patient relationship

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Outcome evaluations:

Fulfilling my role as a doctor is:

Extremely undesirable -3 -2 -1 0 1 2 3 Extremely desirable

Helping patients to improve their health is:

Extremely undesirable -3 -2 -1 0 1 2 3 Extremely desirable

Preventing patients needing to return to the healthcare system is:

Extremely undesirable -3 -2 -1 0 1 2 3 Extremely desirable

Damaging the doctor-patient relationship is:

Extremely undesirable -3 -2 -1 0 1 2 3 Extremely desirable

Define how to score indirect attitudes: ReBEQUI manual suggests the following process for creating a global score.

$$A = (a \times e) + (b \times f) + (c \times g) + (d \times h)$$

A = Total attitude score

a, b, c & d = Behavioural belief scores

e, f, g, & h = Outcome evaluations

[Positive scores means the participant is in favour of performing the behaviour whereas a negative score indicates they are against performing the behaviour]

SUBJECTIVE NORMS

Direct measurement of subjective norms

Direct measures of subjective norms should reflect opinions of important people in general and the below formats are suggested. Furthermore, any question that is formatted so that it is made up of an incomplete sentence (e.g. I should/ should not), should be arranged so that the ends of scales are a mix of positive and negative end points. However, where an item is a complete sentence, end points should not be mixed up.

Most people who are important to me think that I should discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

It is expected of me that I discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I feel under social pressure to discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Define how to score subjective norms directly: Recode items that have negatively worded endpoints on the RIGHT so that higher scores reflect greater social pressure to do the target behaviour. It is important these (and all direct measures) have high internal consistency (i.e. high correlations). Items may be omitted to improve this. Calculate the mean of the item scores to give an overall subjective norm score.

Indirect measurement of social norms – Measuring normative beliefs and motivation to comply

An elicitation study normally aims to identify sources of social pressure regarding the behaviour in question. The qualitative study being used in this case (Chisholm, Hart, Lam, et al., 2012) suggests three potential sources of social pressure: other medical students, other doctors and the patients themselves. The following questionnaire items should assess the strength of these social pressures and motivation to comply with them. Items also reflect what important people think a person should do (injunctive norm) or what other people actually do (descriptive norms).

Items to assess normative beliefs:

Obese patients think I

Should not -3 -2 -1 0 1 2 3 Should

discuss lifestyle change with them

Qualified doctors would

Disapprove -3 -2 -1 0 1 2 3 Approve

of me discussing lifestyle change with obese patients

Other medical students

Will not -3 -2 -1 0 1 2 3 Will

discuss lifestyle change with obese patients in the future

Items to assess motivation to comply:

Patients' approval of my practice is important to me

Not at all 1 2 3 4 5 6 7 Very much

What qualified doctors think I should do matters to me

Not at all 1 2 3 4 5 6 7 Very much

Doing what other medical students will do is important to me

Not at all 1 2 3 4 5 6 7 Very much

Define how to score indirect attitudes: ReBEQUI manual suggests the following process for creating a global score.

$$N = (a \times d) + (b \times e) + (c \times f)$$

N = Total indirect subjective norm score

a, b, c = Normative belief scores

d, e, f = Motivation to comply

[Positive scores means the participant experiences social pressure to perform the behaviour whereas a negative score indicates they experience social pressure not to perform the behaviour]

PERCEIVED BEHAVIOURAL CONTROL (PBC)

Direct measurement of PBC

This should be made up of self-efficacy items (assessed by difficulty and confidence regarding the behaviour) and controllability items (assessed by asking if the behaviour is up to them, and if factors are beyond their control).

Self-efficacy items

I am confident that I could discuss lifestyle change with future obese patients if I wanted to

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

It will be easy for me to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Controllability items

Once qualified as a doctor, the decision for me to discuss lifestyle with obese patients will be beyond my control

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

When I am qualified as a doctor, whether I discuss lifestyle change with obese patients or not is entirely up to me

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Define how to score direct PBC: Recode items that have negatively worded endpoints on the RIGHT so that higher scores reflect greater level of control over the target behaviour. It is important these have high internal consistency (i.e. high correlations). Items may be omitted to improve this. Calculate the mean of the item scores to give an overall PBC score.

Indirect measurement of PBC – Measuring control beliefs and their perceived power to influence behaviour

These items should reflect the beliefs which might make the behaviour in question difficult to perform, and the perceived power these factors are perceived to have in influencing the target

behaviour. The qualitative work being used here (Chisholm, Hart, Lam, et al., 2012) suggests that these factors include a doctors' lack of skills, lack of time/opportunities, patients being unable/willing to change, not being certain of the doctors' role in this, and fear over offending the patient.

Control beliefs

When the opportunity arises I will feel unsure of how to help obese patients to change aspects of their lifestyles

Unlikely 1 2 3 4 5 6 7 Likely

There will be very little time or opportunity for me to adequately discuss lifestyle change with my future obese patients

Unlikely 1 2 3 4 5 6 7 Likely

Obese patients will be unable or unwilling to make changes to their lifestyles

Unlikely 1 2 3 4 5 6 7 Likely

I will be unclear about what my role actually entails when supporting obese patients to change aspects of their lifestyles

Unlikely 1 2 3 4 5 6 7 Likely

By discussing lifestyle change with obese patients I am likely to cause offence

Unlikely 1 2 3 4 5 6 7 Likely

Power of control beliefs in influencing the behaviour

If I feel unsure of how to help obese patients change aspects of their lifestyles, I am

Less likely -3 -2 -1 0 1 2 3 More likely

to initiate discussions on this with them

If there is little time or opportunity to discuss lifestyle change with obese patients, I am

Less likely -3 -2 -1 0 1 2 3 More likely

to initiate discussions on this with them

When patients are unwilling or unable to make changes to their lifestyles it makes it

Much more difficult -3 -2 -1 0 1 2 3 Much easier

to discuss the subject with them

Being unclear on my role in supporting obese patients to change aspects of their lifestyle means it is

Less likely -3 -2 -1 0 1 2 3 More likely

that I will initiate discussions on this with them

Causing offence to obese patients through raising issues around lifestyle change, makes it

Much more difficult -3 -2 -1 0 1 2 3 Much easier

to discuss this with them

Define how to score indirect PBC:

ReBEQUI manual suggests the following process for creating a global score.

$$\text{PBC} = (a \times f) + (b \times g) + (c \times h) + (d \times i) + (e \times j)$$

PBC = Total PBC score

a, b, c, d, e = Control belief scores

f, g, h, i, j = Behavioural influence scores

[Positive scores means the participant feels in control of the behaviour whereas a negative score indicates they do not feel in control of the behaviour]

Appendix C: Direct Theory of Planned Behaviour questionnaire items (Chapter 9)

Theory of Planned Behaviour questionnaire (Direct items only) - VERSION 1

Intentions

1. I intend to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

2. I expect to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

3. I want to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Attitudes

4. My attitude towards discussing ways to adopt healthier lifestyles with obese patients is

Negative 1 2 3 4 5 6 7 Positive

Discussing ways to adopt healthier lifestyles with obese patients is likely to be:

5. Unimportant 1 2 3 4 5 6 7 Important

6. Worthless 1 2 3 4 5 6 7 Valuable

7. Difficult 1 2 3 4 5 6 7 Easy

8. Uncomfortable 1 2 3 4 5 6 7 Comfortable

Subjective norms

9. Most people who are important to me think that

I should not 1 2 3 4 5 6 7 I should

discuss lifestyle change with obese patients

10. It is expected of me that I discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

11. I feel under social pressure to discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Perceived behavioural control

12. I am confident that I could discuss lifestyle change with future obese patients if I wanted to

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

13. For me to discuss lifestyle change with obese patients in the future will be

Difficult 1 2 3 4 5 6 7 Easy

14. Once qualified as a doctor, the decision for me to discuss lifestyle with obese patients will be beyond my control

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

15. When I am qualified as a doctor, whether I discuss lifestyle change with obese patients or not is entirely up to me

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Theory of Planned Behaviour Questionnaire (Direct items only) VERSION 2

We are interested in why medical students do or do not go on to discuss lifestyle change with obese patients once qualified. This would include things like talking to patients about doing more physical activity or eating a healthier diet. We would appreciate your responses to some questions about this. **When answering them please imagine that you are qualified as a doctor.** There are no right or wrong answers. Please tell us what you really think and circle ONE number in response to questions 1-15.

Intentions

1. I intend to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

2. I expect to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

3. I want to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Attitudes

For me, discussing ways to adopt healthier lifestyles with obese patients will be:

4. Bad 1 2 3 4 5 6 7 Good

5. Unimportant 1 2 3 4 5 6 7 Important

6. Worthless 1 2 3 4 5 6 7 Valuable

7. Unpleasant 1 2 3 4 5 6 7 Pleasant

8. Unrewarding 1 2 3 4 5 6 7 Rewarding

Subjective norms

9. Most people who are important to me think that

I should not 1 2 3 4 5 6 7 I should

discuss lifestyle change with obese patients

10. It is expected of me that I discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

11. People who are important to me want me to discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Perceived behavioural control

12. I am confident that I could discuss lifestyle change with future obese patients if I wanted to

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

13. I will have control over deciding whether to discuss lifestyle with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

14. For me, discussing lifestyle change with obese patients will be

Difficult 1 2 3 4 5 6 7 Easy

The University
of Manchester

MANCHESTER
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MBCChB

Faculty of Medical and Human Sciences

School of Medicine

Year 5: Semester 2
Communication skills
2012

Session title: Lifestyle change
communication

Learning effective communication to support patients
change unhealthy behaviours

Year 5 Tutor Notes

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Introduction, Aims and Overview

These notes give detailed guidance for delivering the session titled 'lifestyle change communication', as well as general information about the aims, frameworks and the context in which this session is placed.

If you have **queries or would like further information**, please contact:
Anna Chisholm, tel. 0161 306 1751, email:
anna.chisholm@manchester.ac.uk

Aims

- To prepare students for their future career as a doctor and particularly for progression onto foundation programmes
- To develop effective medical communication within the context of discussing lifestyle change with patients
- To give students the skills and confidence to use evidence-based behavior change techniques in future consultations with patients

Overview of the 'lifestyle change communication' session

The session will be delivered to groups of 8-10 year 5 medical students and will last 3 hours.

Sessions will be delivered by pairs of GP specialty trainees.

The session involves

- context setting
- group brainstorming to consider key issues
- introducing students to evidence-based behaviour change techniques
- using audio and visual media to illustrate key issues
- role play and full group activities.

Students will not have been asked to do any preparation for the session and will not be assessed on this topic, however it is expected that the knowledge and skills students gain will be beneficial to progressing onto foundation programmes and in preparing them for the increasing patient contact they will encounter.

Context and Additional Reading

Context

- This sign up session is offered to medical students during the post-exempting period of year 5 and is not a compulsory part of their course.
- Students have been invited to attend the session so that they can prepare for entering onto foundation programmes and so they can develop key communication skills within the area of lifestyle change. Lifestyle change refers to supporting patients to change unhealthy behaviors such as smoking, drinking alcohol, physical inactivity and poor diet.
- Students will have had lectures on behaviour change, public health, nutrition, and preventive medicine at various stages during their medical course but will **not** have received practical teaching on specific evidence-based behaviour change techniques that can be used with patients in practice. Thus the unique aspect of this session for students will be learning about the mechanisms of behaviour change techniques and how to use these with patients in practice.

Additional reading

- This session is based on numerous theories of behaviour developed within the behavioural and social sciences literatures.
- ***A useful summary of these theories can be found in a standard health psychology text, or particularly recommended is Psychology for Medicine by Susan Ayers and Richard de Visser***
- 2 key publications in the area are:
 - 1) Michie, S., Ashford, S., Sniehotta, F. F., Dombrowski, S., Bishop, A., & French, D. P. (2011). A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: The CALO-RE taxonomy. *Psychology and Health* 1-20.
 - 2) Dixon, D., & Johnston, M. (2010). Health behaviour change competency framework: Competences to deliver interventions to change lifestyle behaviours that affect health. *Journal*. Retrieved from <http://www.healthscotland.com/documents/4877.aspx>
- Students will not be directed to these papers during the session but are included here for tutors to consult if they wish to do some further reading.

Timetable, Materials and Tutor Preparation

In advance of the session you will be provided with details of the venue and time of the sessions you will deliver. You will also be provided with all the materials needed.

Materials will include:

- 1) PowerPoint slides
- 2) Mr Thorpe audio clip (on pen drive)
- 3) 3 video clips – Nicky, Sallie, Mrs Patel (on pen drive)
- 4) TENT PEGS handout (behaviour change techniques breakdown)
- 5) 'Yes but' exercise handout
- 6) Role play feedback sheet

* A computer, projector, and flipchart paper will be available within teaching rooms.

Tutor preparation for session:

- The tutors should think about personal experiences of discussing lifestyle change with patients and bring short notes on their experiences if they wish (to use within section 2.2).
- Before the session begins, set up video clips in separate windows to the PowerPoint slides (Nicky and Sallie clips for Section 3.1; Mrs Patel clips for Section 3.4).
- Ensure all required handouts (no. 4, 5 & 6 above) are printed and ready to be given to students during the session (however enough should be provided to you prior to the session). Students will be able to take away the TENT PEGS and 'yes but' exercise handouts (no. 4 & 5) but you will need to collect in and return the completed role play feedback sheets (no. 6).

Session Breakdown

Timings for session

3 hour session in total (includes 15 minute break)

Section	Description	Duration
1. Introduction		
1.1	Sign post to session structure	} 10 minutes
1.2	Case example	
1.3	Session objectives	
1.4	Considering 'why behaviour change'	15 minutes
		Total: 25 minutes
2. Complexities of behaviour change		
2.1	Brainstorm - Own behaviour change	20 mins
2.2	Brainstorm – Impact on job of doctor	20 mins
		Total: 40 minutes
3. Behaviour change techniques		
3.1	Patient perspective video clips	5 mins
3.2	Communication strategies to avoid	15 mins
3.3	Helpful communication strategies	20 mins
<i>Break</i>		<i>15 mins</i>
3.4		15 mins
3.5	-----	30 mins
		Total: 1 hour 40 minutes
4. Summary		
4.1	Reflection	Total: 15 minutes
4.2	Review objectives	
4.3	Discuss - What will you take away?	

1. Introduction (25 minutes total)

<i>Timing</i>	<i>Teaching instructions</i>
2 mins	<p>1.1 Sign post to session structure</p> <ul style="list-style-type: none">• Briefly explain the following breakdown of the session structure to students. <p><u>Section 1:</u> <i>Introduction to the topic, learning objectives, and thinking about why this subject is important to healthcare.</i></p> <p><u>Section 2:</u> <i>Brain storms and group discussion about the difficulties of managing patients with lifestyle-related problems.</i></p> <p><u>Section 3:</u> <i>Introducing specific evidence-based behaviour change techniques (i.e. what is helpful and what is not when encouraging patients to change aspects of their lifestyles). You will have a go at 2 role play exercises using these.</i></p> <p><u>Section 4:</u> <i>Summarise and wrap up the session as a group.</i></p>
5 mins	<p>1.2 Case example (<i>Aim: To set the scene, show what kinds of patients we are talking about in this session, and illustrate frustration involved in consultations like this</i>)</p> <ul style="list-style-type: none">• Show PowerPoint slide 2.• Play the audio clip of a GP discussing his patient (Mr Thorpe).• If there is a technical fault read out the script below instead.

“My name is Dr Phillip Burns and I’m a GP in South Manchester. I’d like to tell you about Mr Thorpe who is 62 years old and has developed type 2 diabetes at the age of 55. During these years he’s returned to me on numerous occasions with complications associated with this. He’s recently reported some blurring of his eyesight, which is of a particular concern to me. Also, as his fitness has faded and tiredness levels crept up, the day to day activities he used to enjoy such as gardening and taking his grandchildren to the park, have become increasingly difficult. Mr Thorpe and I have talked about the fact that he has put on between 2 and 3 stones over the last 5 years but I don’t often get anywhere with that. The problem I have is that I know that most of his problems would be substantially improved (and could have been avoided in the first place) if he could lose some weight, particularly through exercising regularly and making some key changes to his diet. Despite this, his condition is actually worsening and any attempt to discuss Mr Thorpe’s eating or activity patters are met with defensiveness and excuses as to why he is unable to change his lifestyle. That might be that his wife cooks him the wrong food or he dislikes tiring himself out with the grandchildren, there’s always something. Consultations with Mr Thorpe are challenging and if I’m honest can be disheartening; it’s difficult to know what else to try”

3 mins

1.3 Session objectives

- Show PowerPoint slide 3.
- Read out the session objectives for students and tell them they will be reviewed at the end.

15mins

1.4 Considering ‘why behaviour change’

- Use PowerPoint slides 4-8 to clearly state the following points to students.

Slide 4 The GMC expects all medical students to graduate from medical school competent in discussing behaviour change with patients.

Slides 5 & 6 Why? Because most illnesses in today's society are caused or maintained by unhealthy behaviours (lifestyles).

Slide 7 Brainstorm on flip chart paper (5 minutes only): How does obesity impact on patients' health and wellbeing?

Further information: You may use the below issues to prompt discussion amongst students, or you may decide to use other examples you feel are relevant and important to this questions. Examples of obesity-related consequences to patients' health and wellbeing:

- *Clinical factors: Causes and maintains illnesses and disease, additional complications, impacts on recovery, risk under anaesthetic.*
- *Non-clinical factors: Emotional strain, self-image, impact upon jobs, socialising, school (children).*

Slide 8 We know that opportunities to support patients change their behaviours occur throughout the healthcare system:

- Doctors report this is **important** to their jobs
- But it can cause **frustration**
- They can feel unconfident/unsure discussing lifestyle with patients
- Doctors often attribute this to lack of **training**.
- This leads to many missed opportunities in healthcare and this inevitably leads to illnesses not being prevented or properly managed.

Further point [no slide] There are many evidence-based strategies you can use to help patients change unhealthy behaviours. We know from research these are useable and work in practice with individuals that need to change unhealthy behaviours. This is what we will look at in this session.

2. Complexities of Behaviour Change (40 minutes total)

<i>Timing</i>	<i>Teaching instructions</i>
20mins	<p>2.1 Brainstorm (What is it like to change your own behaviours?)</p> <ul style="list-style-type: none"> • Show PowerPoint slide 9. • Ask students to use personal experiences to answer the questions. • Students should spend 2 minutes noting down answers to the questions <div style="border: 1px solid black; border-radius: 15px; padding: 10px; margin: 10px 0; background-color: #e0f2f7;"> <p style="text-align: center;"><i>Further information: They should consider the complexities involved in changing physical activity/dietary patterns. The aim here is to highlight to students that whilst it may seem simple to alter one's diet/activity patterns, we know from our own experiences that even very small changes to behaviours can be quite tough to achieve. If students can't think of a time they tried to change their own lifestyles have they known someone else that has (e.g. family member, work colleague, friend)?</i></p> </div> <ul style="list-style-type: none"> • Encourage students to share and discuss what they have written down with the group. Tutor should use prompts to facilitate discussion and note down points raised on flipchart paper. <p style="margin-left: 40px;"><u>Prompts if needed:</u></p> <p style="margin-left: 40px;"><i>What influence did friends/family have? Were they supportive, if so how? Or did they make temptation difficult? What times of day were most difficult/easy? Busy times? Morning? Later at night? How did your emotions play a part? Did you get frustrated? If so how did you deal with it?</i></p>

20mins	<p>2.2 Brainstorm (Obesity: Obstacles for doctors?) <i>Aim: Get students to think about one particular area of lifestyle change and how it will impact on the job they will be doing as doctors. Tutors should share their own experiences of working in practice throughout this task. Tutors may discuss how often lifestyle arises in practice or share a time when a behaviour change discussion was particularly complex/difficult, or went particularly well.</i></p> <ul style="list-style-type: none">• Show PowerPoint slide 10.• Ask students to consider how obesity as a condition will impact upon the job of the doctor within healthcare settings.• Discuss answers as a group. Tutor should use prompts where necessary and record points raised on flipchart paper. <p><u>Prompts if needed:</u></p> <p><i>You may need to incorporate behaviour change into the ‘clinical plan’ with the patient; May need to consider your communication style (e.g. sensitive, non-judgemental); May come across patient resistance, barriers to change.</i></p>
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3. Behaviour Change Techniques (1 hour 40 minutes total)

Timing	Teaching instructions
5 mins	<p>3.1 Patient perspective video clips</p> <p><i>Further information: These are examples of what might result from a successful, or a problematic doctor-patient interaction. Both clips are of real patients talking about real healthcare experiences. Both Nicky and Sallie have chronic illnesses that would be improved by reducing her weight. The videos do not specify which conditions they suffer from and this should help make the clips seem generalisable to many different obesity-related conditions.</i></p> <ul style="list-style-type: none"> • Play the clip of Nicky. • If the video clips fail to play on the day, read out the transcript instead. <div style="border: 1px solid black; border-radius: 25px; padding: 15px; background-color: #e0f2f7;"> <p style="text-align: center;"><i>Nicky Video Clip Transcript:</i></p> <p><i>Nicky reacted badly to some of the suggestions made by her GP when she was first diagnosed.</i></p> <p><i>“The other part alongside the disbelief, was complete denial, because one of the first things my darling GP said to me was, ‘This is going to knock 15 years off your life.’ Gee thanks, doc, you know, sod off! And the other thing is that I had these two young kids. I think they were about 8 and 10, maybe 8 and 11, at the time. You know, it was inconceivable to me that I was having a degenerative disease that was just going to tail off until, poof, there wasn’t going to be anything there. So no, that was definite denial. Also what he told me to do was to lose weight. Well, you know, like every other damn woman in Britain, I’d been trying that for some years without any success. And to take up squash. Squash was going to sort my obesity problems. Okay, right, you know, bloody ridiculous! So my first reaction to anything is to go and learn about it so I. Oh and ‘Don’t look on the internet because the internet is full of rubbish’. So, went on the internet, as you do you know!”</i></p> </div>

- Summarise the clip once it had been played.

*Some ideas: Draw attention to the fact the Nicky was **told** to lose weight by her doctor and that she was unhappy with them suggesting she takes up squash to achieve this. She seemed resilient and annoyed with how her doctor had spoken to her about her weight. Ask students what they thought might have been **unhelpful** in the consultation Nicky had before moving onto playing the next clip.*

- Play the clip of Sallie
- If the video clips fail to play on the day, read out the transcript instead.

Sallie Video Clip Transcript:

Sallie was dreading being weighed at the clinic but said that the nurse was 'brilliant'.

“Well actually, within the last two weeks, when I went for my check up yesterday, because I am going to a weight clinic now apparently. I call it the fat clinic, but it is the weight clinic. And she asked how I was getting on and I said I was doing really well and feeling a lot better on the medication. She said, “Do you think you have lost weight?” And I said, “Well really, if I have it is a bonus, because I'm feeling so better, and the losing weight bit doesn't really matter.” And I have lost 7lb in two weeks. So, obviously what I am doing is working and... I got on the weights and she said how tall are you? I said, '8' 3"...' So anyway, I was only 5' 4" which was disappointing. So I've shrunk two inches somewhere. I always used to be 5' 6"”.

[Interviewer] So do they kind of zap you with science, like talking about your body mass index. I mean do you know about stuff...?

No, no, the nurse I saw yesterday was absolutely brilliant. The first time I'd met her. I was a little bit apprehensive. Late going in. I thought I am going to leg it, I can't go through with it. But I did go in and I was glad, yeah. Then the word obese come up on the computer. And she said, "I want you ignore that word." She said, "It is the most horriblest word ever." Because it is, you know, like how they describe you isn't it? Like if you are over such and such a weight, but we were laughing about that. But she was alright, very good. Very good."

- Summarise the clip once it has been played

*Some ideas: Sallie expressed **negative emotions** about even entering the weight clinic. She was afraid to go in and nearly didn't go. Despite these emotions her experience was a positive one and this seemed to have a lot to do with how the health professional spoke to her. She had made her feel at ease (through using humour) and hadn't 'zapped' her with science. Ask students what they thought might have **helped** to make Sallie feel good about her consultation with the nurse.*

15mins

3.2 Communication strategies to avoid

- Explain that some strategies are usually ineffective in supporting patients to change unhealthy behaviours: 1) Scare tactics, 2) Financial incentives, 3) Information alone.

*Further information: This is probably because they all ignore reasons people engage in unhealthy behaviours and the real world **barriers that stop people from changing**. They also don't let patients decide for themselves they want to change and may have the opposite effect than desired because we know that **confrontation breeds resistance**.*

- Show slide 11. Talk through the mechanisms of ineffective behaviour change strategies - in this case we are using the example of scare tactics.

Points to emphasis from slide 11

- *Scare tactics do not work (placing fear-inducing photos on cigarette packets for example).*
 - *Scare tactics can actually reduce people's motivation to change.*
 - *They can also make things worse by driving people to disengage with the source of the fear (e.g. health advice/services) rather than changing the actual behaviour in question.*
 - *Therefore it is not a strategy we would recommend using with patients.*
- Show slide 12. This illustrates 'What to avoid - Taking the side of change'.

Additional information: This slide explains the theory behind how people make decisions to change or not i.e. if people have not yet changed they may have balanced reasons for changing and for not changing (creating internal conflict). It also highlights that what other people say to that that person can influence their decisions about change.

- Give students the 'yes but' handout. This illustrates 'What to avoid' - Evoking and avoiding patient resistance.

Additional information: This handout shows this theory in action. Page 1 (ending up with yes but...) shows the doctor taking the side of change which results in the patient defending why they do not want to change. Page 2 (avoiding yes but...) shows the doctor refraining from advocating change and actually slightly takes the side of not changing by highlighting a reason the patients might not want to change ('it's not easy'). This results in the patients expressing their reasons for wanting to change and thus creates a much more productive discussion.

20mins

3.3 Helpful communication strategies

- Give students the TENT PEGS hand out.



Additional information: The tutor should address issues of time pressure here by explaining that the aim of using these behaviour change techniques (or TENT PEGS) is not about spending lots of time on this with patients; rather it is important to approach the conversation you will have with patients, and the time you are able to allocate to discussing lifestyle change in the most effective way possible.

The TENT PEGS components make up a tool kit of behaviour change techniques students can pick and chose from with different patients. In this way lifestyle change discussions can be tailored to each patient and context that arises (which reflects NICE guidelines - <http://guidance.nice.org.uk/PH6>).

- The TENT PEGS handout consists of 7 main domains which explain methods of helping patients to change unhealthy behaviours. One page for each domain.
- At the top of each page is an example of the technique being used.
- Underneath the example is a breakdown of specific behaviour change strategies that fit into that domain.
- Look over each domain in turn with the students. Talk through the examples provided and discuss as a group how they think this could work in practice with patients.
- Draw attention to the fact that doctors, once familiar with the TENT PEGS can pick up cues from what patients say within consultations to direct them towards using different behaviour change techniques.

[This is illustrated by each example in the handout where you will notice that the patient always says something to prompt the doctor to use a particular behaviour change strategy i.e. patient discusses emotions preventing behaviour change so the doctor picks up on an emotion based TENT PEG]

15mins

~ BREAK ~

15mins **3.4 Group role play**

- Play the video clip of Mrs Patel.
- If the video doesn't play read out the transcript below instead.

Mrs Patel Video Clip Transcript (interviewer's speech in bold)

"That is very good but I don't do it [laughs].

Why?

[Laughs] You have to have an initiative to do it, it's exercise, yes I do a bit of it, because of my back, not that I, but it would help. But the exercise you see my brother as I said, he used to swim a lot. He was a very good swimmer. Every day he would swim about three, four miles in sea water, not swimming pool, swimming pool was different. And whenever you see he had controlled his diabetes so much that he whenever he goes to swim, before swimming he would check his blood sugar, look at the levels. And then he comes back and he checks it immediately. There is a drop in sugar level always, but after two hours of resting, after swimming two hours of resting, sugar level is same like before. It hasn't gone down or it hasn't been more or less but still the same and when he eats after that, obviously, it will go up. But with exercise, you see, with him it has happened so I don't know how much will it help? It can control your weight, that is for sure you can't put on weight. But if your weight is stabilised and if it is just the same, I don't think exercise will help. But they say it is proved that exercise will help [laughs].

Have you as a family always taken exercise? I mean you said your brother loved swimming. Have you ever done anything regularly?

No, no, no. I haven't. Not now. Not after diabetes. I used to swim, I used to be a life-saver as well [laughs]. But not, not for the last forty years. I haven't gone in waters at all [laughs].

What about going out for a walk?

Yeah, that would help. That is very good but I, with me, I am a different person for walking. If I had to walk I would walk, but not on a regular basis. It is very good.

It's just when you were talking about if you take your blood glucose levels and they're too high in the morning, you said to me you'll eat one less chapatti.

Yeah.

Yeah. I mean another of approaching that would be to go for a walk.

Walk.

But you don't do that?

No, I don't do. If I do exercise, I know it is good for me and good for my health and for my physical but somehow it doesn't appeal to me. Going for a walk. It's me only. Lot of people do and it would help.

Yeah.

You see. I am sure.

Is it more difficult for people from your background, women your, from your culture to take exercise?

No, no.

No, it's not a problem?

No, no. No problem. Everybody does it, nowadays, very few, one maybe like me, [laughs] not so many.

Do they try to get you take exercise when you go to the hospital and the doctors?

They tell me and I said, I that is, I just can't do it. My husband walks three miles, with his eyesight and with all his problems, every day. He tells me to go every time, but I don't do. It's only me, as I said [laughs]. Not that, it is going to get any, I know it would benefit me.

Okay.

But is not... mentally I am not prepared to walk [laughs]."

Instructions for role play

- Students should imagine they have the task of discussing weight loss with Mrs Patel.
- Each student should spend 2 minutes constructing a question or an approach they might use with Mrs Patel (use TENT PEGS sheet).
- Go round the group and ask everyone to give 1 suggestion. *Remind students to use the patient's speech to guide them in choosing which behaviour change technique to select (it may be that you need to replay the video clip for students to be able to do this).*

Points for tutors:

1) Telling Mrs Patel about benefits of exercising alone would be ignoring real reasons that stop her from exercising and telling her what she already knows and this will likely result in resistance from her and thus an unproductive consultation. Encourage students to use other behaviour change strategies instead.

2) Because 'confrontation breeds resistance', when students share their ideas encourage them not to simply give Mrs Patel lots of suggestions about how she could change, i.e. 'Why don't you walk to work?' 'You could stop eating chocolate'. Instead praise students for using more helpful approaches such as asking Mrs Patel 'How could you change your diet?' 'What opportunities are there in your day to day to walk more?' 'What might stop you from doing that?' 'How might you get around this?'

3) Also praise students for selecting behaviour change techniques based directly on what Mrs Patel has said.

Prompts for discussion if needed

- Why did you choose that question?
- What might you expect Mrs Patel's response to be?
- What would you do next following Mrs Patel's responses?

30mins 3.5 Role play in pairs or 3's

- Show PowerPoint slide 13.

Additional information: This slide displays an outline of Mr Thorpe and is the same as the audio clip played to students at the beginning of the session.

- Allocate students to pairs or groups of 3: one doctor, one patient, and one observer where necessary.
- Hand out the role play feedback sheet.
- Students conduct a 7 minute role play. Discussions should centre on how

Mr Thorpe will try to change his eating or activity patterns.

Additional information: Although the outline of the patient character is given on the slide, it is up to the students playing Mr Thorpe to improvise regarding his specific circumstances and reasons for engaging in the unhealthy behaviours or not engaging in healthier behaviours necessary to improve his diabetes.

- Students should pay attention during the role play to noticing which behaviour change techniques are used from the TENT PEGS handout.
- Following the interview, each pair/group should spend 5 minutes together completing the printed role play feedback sheet.

The tutor should then spend approximately 10 minutes facilitating a group discussion about the following points:

What was the experience like as Mr Thorpe/doctors?

What behaviour change techniques were used? How well did they work?

What was done well?

What would you do differently next time?



Students should return the feedback sheets to the tutor who will give them to a member of the training team to be collated and emailed out so that medical students have written feedback on all groups' experiences in that session.

4. Summary (15 minutes total)

Timing	Teaching instructions
5 mins	4.1 Reflection <ul style="list-style-type: none">• Point out that everyone has had a go at supporting a patient to change at least one aspect of their lifestyle.• Ask students how they have felt doing this today and also how they feel about having a go at this with patients in the future.
5 mins	4.2 Review objectives <ul style="list-style-type: none">• Show slide 14.• Discuss to what extent students feel these objectives were met.
5 mins	4.3 Discuss – What will you take away? <ul style="list-style-type: none">• Ask students to think of one thing they learnt or will take away from this session and share it with the group.

~ END OF SESSION ~

Appendix E: Questionnaire items – Knowledge (Chapter 9)

Knowledge is not included in the TPB questionnaire but is relevant to the current study. We are expecting that improved knowledge of BCTs will relate to improvements in other constructs because the BCTs are central to the intervention being delivered. Thus it is important to know if participants' knowledge of this (and ability to apply them as above) has changed following intervention delivery and also what initial knowledge levels began at.

Knowledge of behaviour change techniques:

Although many of the below statements might make up important elements of clinical interactions about obesity management, not all may be effective in supporting patients to change aspects of their lifestyles. Check all that you believe are helpful techniques to support someone to change their unhealthy diets/activity patterns:

- Tell them that their health will continue to deteriorate with such low physical activity levels
- Ask them how they might feel about their weight in 10 years time
- Ask them to keep a food diary for 2 weeks
- Inform them of the likely consequences of their unhealthy behaviours
- Encourage them to believe in themselves through using positive comments
- Ask them to think about things that might prevent them from changing
- Describe the associations between obesity and cardiovascular diseases
- Discuss specific feasible steps to achieving changes in their diet
- Tell them they need to increase their activity levels
- Discuss how they might avoid places where sticking to a healthy diet is particularly difficult
- Highlight how important it is to reduce their fat intake
- Prompt them to use other people in their lives for support
- Provide them with national weekly recommendations for physical activity levels
- Explain the key reasons why obesity causes health problems

Define how to score knowledge: Seven answers (highlighted in purple) are known BCTs, therefore participants receive one point per BCT. Maximum points = 7. They will also lose one point for each incorrect answer ticked. Thus the minimum possible mark is -7.

Appendix F: Questionnaire items – Behaviour (Chapter 9)

Behavioural simulation measure: This section would be seen as an intention measure according to the ReBEQUI manual but will also be used as our skills measure because it is the closest way we have of measuring actual behaviour with medical students. Nine scenarios below prompt participants to give free-text written responses regarding how they would construct conversations with obese patients about how to change aspects of their lifestyles. Further, each scenario included clues as to what kind of behaviour change techniques might be helpful to use with each patient. The manual suggests writing 10 scenarios for simulation measures but as we are prompting longer open questions this would not be feasible. It is therefore proposed that three different scenarios (of equal difficulty) are included each time participants complete the questionnaire (maximum 3 times).

Participants would be provided with the following instructions regarding how to respond to each item. Their free-text written responses will be coded for the strategies they select to use with each simulated patient.

Participant instructions:

Read each scenario below. Each one contains some information about a patient, and a statement from them regarding their experiences or feelings about making changes to their lifestyles in order to lose weight. Imagine you are the doctor in each scenario and think about what you would say to each patient based on their statements. Your response should aim to help them change their unhealthy behaviour(s). Use the text boxes provided to write down a response to each patient (as if you were actually talking to that patient). You may write as much or as little as you like.

Scenario 1 – Prompts goals setting strategies



Mr Baker is 48 years old, works close to the city centre and lives with his wife and 2 children near by. His blood cholesterol levels and blood pressure have been increasing over the last 2 years and his BMI is now 32. Mr Baker has a busy life and has struggled to lose weight in the past.

Patient statement: "I know I've got to keep an eye on my blood pressure, especially now but I'm going to find it hard to get rid of the weight, it's such a big task and with my job and kids and all, it seems like a mountain to climb, it's too much to do all in one go"

Scenario 2 – Prompts barrier identification and resolution strategies



Mrs Taylor is 63 years old, lives with her husband and is retired. Although she has always been overweight and in fairly good health, she developed type 2 diabetes 5 years ago. Despite wanting to become more active to comply with what her doctors had advised, she hasn't managed to achieve this yet.

Patient statement: "Being diagnosed with diabetes was quite a shock to me when it happened, but what has been more difficult to deal with is that I've been wanting to get involved with this walking group I know of, get out in the open air you know but, it's so frustrating I just haven't managed to get to doing it. I know that must sound like an excuse but it's awfully frustrating actually"

Scenario 3 – Prompts emotion based strategies



Jenny Peterson is 33 and has been trying to become pregnant for 2 years with no success. Upon visiting a fertility clinic the doctor advised her that losing 2-3 stones in weight would be the most effective way of increasing her chances of conceiving. Jenny has been overweight since she was a child and often tries out different diets and weight loss tips she hears about but as yet has not been able to reduce her weight.

Patient statement: "I've tried so hard to lose weight, particularly with my diet but sticking to it gets so tough especially when I'm wound up with work. I often feel stressed out and when I'm going through a phase like that it's hopeless trying to cut down on the food I like because I know I can calm myself down by relaxing with a film and some nibbles"

Scenario 4 – Prompts practice strategies



Mr Banks is 65 years old and has a large family with 6 grandchildren. He was diagnosed with osteoarthritis 10 years ago and has a BMI of 36. He has been told before that controlling his weight would ease the pressure on his joints and over the years he has noticed that at lower weights he experiences less pain.

Patient statement: “One of the things I miss out on is taking my grandchildren swimming. I’m nervous about going along with them and them tiring me out but I’m sure if I put my mind to it I could do it. I did before; I’ve got out of the habit of it really”

Scenario 5 – Prompts empowering strategies



Andy Swift 37 years old and has had a BMI of over 30 for over 10 years. Although he has been overweight for a long time, recently he has been noticing difficulty with breathing and a heavy chest, particularly when walking around shopping or climbing stairs. He has also been getting indigestion more regularly than he has had it in the past. He previous GP old him about the risks of heart disease and advised him to get healthier and try to lose some weight.

Patient statement: “I don’t really feel very motivated to change my whole lifestyle around; I’ve been big for a long time and have always eaten the way I do. My doctor told me how important it is to keep my heart healthy now but I’m not a very strong person, especially with these things, I’m probably going to fail every attempt at tackling this”

Scenario 6 – Prompts social support strategies



Bethany Becksdale is 29 years old and has a BMI of 31. She also has 3 children and works as a primary school teacher. She has noticed increasing episodes of pain in her lower back and upon visiting her GP has been advised to lose weight. Other than her back pain she has no other health problems.

Patient statement: “I know it’s bad but I will often feed the kids (and myself) pizza and chips on an evening to save time after a long day at work. I really enjoy eating my desserts as well. I can tell I’m having a negative impact on the kids though as they’re asking for that junk food more and more often now”

Scenario 7 – Prompts environmental change strategies



Hannah Smith is 32 years old and has been gaining weight quite rapidly over the last 2 years (her BMI is now 30). Hannah suffers with asthma and has noticed it worsening over the last couple of years; although she usually controls it well, she is beginning to struggle with it. Her doctor has suggested trying to lose some weight in order to prevent her condition worsening.

Patient statement: “I’ve coped pretty well with my asthma up until now and I’m sure this has all happened since I changed jobs 3 years ago. I used to get out and about visiting clients most days in the week but in my new job I’m stuck at a desk most of the day. I end up feeling restless on a night as well and find it hard to sleep. It’s like I’m constantly sat down”

Scenario 8 – Prompts cognition based strategies



Mr Haydon is 54 years old and has a BMI of 32. His father died 8 years ago after having a stroke and most of his family are overweight. Due to his father's health problems Mr Haydon has been advised to increase his physical activity levels and reduce the amount of fatty foods he consumes in order to lose weight himself.

Patient statement: "I have mixed thoughts about my bodyweight; sometimes I consider it irresponsible of my not to get fit and sort it out but other times I think, do I really care and how bad is it to not be in great shape and do I really want to bother putting in all that effort when there's lots of things I like about my lifestyle the way it is"

Scenario 9 – Prompts performance strategies



Mrs Linden 62 years old and on a recent visit to the GP was told that her blood pressure was too high. She has been putting on weight for about 5 years and as she hadn't had any concerns about this had not done anything to try and combat it. However her doctor has advised her to try to alter her diet and increase the amount of exercise she takes.

Patient statement: "I hadn't realised my increasing weight would effect me in this way and I'll try anything to lose some of it but I have no idea where to start. To be honest I'm not entirely sure what foods I eat each week or if I'm buying in too much of the wrong foods. I guess it's something that I just hadn't taken notice of before"

Define how to score behavioural simulation: This will not be scored quantitatively as suggested in the ReBEQUI manual as responses do not produce numerical data. Instead the participants' written free-text responses will be coded for used of desired communication skills (e.g. empathy / active listening) and defined behaviour change techniques (BCTs). The percentage of written responses including demonstration of these skills will then be calculated.

Appendix G: Short version questionnaires (Chapter 9)

LIFESTYLE CHANGE SURVEY (Time 1: pre-session)



Student ID number: Email address:.....
Age:..... Ethnicity:..... Sex: Female Male

Please read the below statements and CIRCLE ONE NUMBER in response to each question

I intend to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Most people who are important to me think that I should not 1 2 3 4 5 6 7 I should discuss lifestyle change with obese patients

For me, discussing ways to adopt healthier lifestyles with obese patients will be:

Bad 1 2 3 4 5 6 7 Good

Worthless 1 2 3 4 5 6 7 Valuable

Unpleasant 1 2 3 4 5 6 7 Pleasant

I am confident that I could discuss lifestyle change with future obese patients if I wanted to

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

It is expected of me that I discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I expect to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

People who are important to me want me to discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I will have control over deciding whether to discuss lifestyle with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

For me, discussing lifestyle change with obese patients will be

Difficult 1 2 3 4 5 6 7 Easy

I want to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree



WHAT WOULD YOU DO?

Mrs Taylor is 63 years old, lives with her husband and is retired. Although she has always been overweight and in fairly good health, she developed type 2 diabetes 5 years ago. Despite wanting to become more active as her doctors advised, she hasn't managed to achieve this yet.

Patient statement: "Being diagnosed with diabetes was quite a shock to me when it happened, but what has been more difficult to deal with is that I've been wanting to get involved with this walking group I know of, get out in the open air you know but, it's so frustrating I just haven't managed to get round to doing it. I'm not sure why, it must be my age or day to day routine or something. I know that must sound like an excuse but it's awfully frustrating actually"

YOUR TASK: Imagine you are the doctor in this scenario. Think about **what you would say** to this patient based on their statement. Your response should aim to help them change their unhealthy behaviour(s). Use the space below to write down a response to Mrs Taylor (as if you were actually talking to that patient). You may write as much or as little as you like.

Prize draw: Would you like the chance to win £100 in Marks and Spencer vouchers? If so please tick this box: (the winner will be chosen at random and contacted via email in July 2012)

LIFESTYLE CHANGE SURVEY (Time 2: Post-session)



Student ID number: Email address:.....
Age:..... Ethnicity:..... Sex: Female Male

Please read the below statements and CIRCLE ONE NUMBER in response to each question

I want to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

It is expected of me that I discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I am confident that I could discuss lifestyle change with future obese patients if I wanted to

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

For me, discussing lifestyle change with obese patients will be

Difficult 1 2 3 4 5 6 7 Easy

People who are important to me want me to discuss lifestyle change with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

I intend to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

For me, discussing ways to adopt healthier lifestyles with obese patients will be:

Bad 1 2 3 4 5 6 7 Good

Worthless 1 2 3 4 5 6 7 Valuable

Unpleasant 1 2 3 4 5 6 7 Pleasant

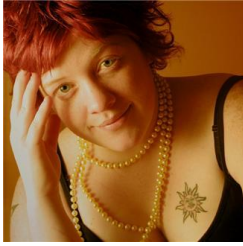
I expect to discuss lifestyle change with obese patients in the future

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Most people who are important to me think that I should not 1 2 3 4 5 6 7 I should discuss lifestyle change with obese patients

I will have control over deciding whether to discuss lifestyle with obese patients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree



WHAT WOULD YOU DO?

Hannah Smith is 32 years old and has been gaining weight quite rapidly over the last 2 years (her BMI is now 30). Hannah suffers with asthma and has noticed it worsening over the last couple of years; although she usually controls it well, she is beginning to struggle with it. Her doctor has suggested trying to lose some weight in order to prevent her condition worsening.

Patient statement: "I've coped pretty well with my asthma up until now and I'm sure this has all happened since I changed jobs 3 years ago. I used to get out and about visiting clients most days in the week but in my new job I'm stuck at a desk most of the day. I end up feeling restless on a night as well and find it hard to sleep. It's like I'm constantly sat down"

YOUR TASK: Imagine you are the doctor in this scenario. Think about **what you would say** to this patient based on their statement. Your response should aim to help them change their unhealthy behaviour(s). Use the space below to write down a response to Mrs Taylor (as if you were actually talking to that patient). You may write as much or as little as you like.

Prize draw: Would you like the chance to win £100 in Marks and Spencer vouchers? If so please tick this box: (the winner will be chosen at random and contacted via email in July 2012)

Appendix H: Tent Pegs Booklet (Chapters 8 & 10)

This Appendix is included as a non-written attachment. It is enclosed within a pocket attached to the back of this thesis.