Perceptions of Obesity as a Health Risk: Psychometric Scale Development and Relationship with Behavioural Intentions

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ABSTRACT

Obesity represents a serious threat to health which can be reduced by volitional control of eating and physical activity behaviour. Social cognition theories propose that such behaviour is influenced by cognitions regarding its desirability. The role of obesity outcome expectancies in predicting weight control behaviour has not been established and there are no psychometrically sound measures of these constructs.

This thesis aimed to investigate the relationship between knowledge and beliefs regarding obesity's consequences and weight control intentions in obese patients. The Obesity Risk Knowledge Scale (ORKS-10) was developed using item analysis and rigorously evaluated in a large population (n=965). The ORKS-10 scale proved to be a short, reliable and valid measure of knowledge regarding the health risks associated with obesity. In addition, thematic analysis of data from focus groups and structured interviews was used to identify 41 salient items for a scale to measure obesity outcome expectancy beliefs. Factor and item analysis were then used to develop the Obesity Outcome Expectancy Beliefs Scale (ObEx-15). The ObEx-15 comprises three reliable and unidimensional subscales; the Health Benefits of Weight Control (HBen), Social and Aesthetic Benefits of Weight Control (SABen) and Costs of and Barriers to Weight Control (Cost).

Obese adults were recruited from weight management clinics (n=110, response rate=54.19%). Multiple regression analysis indicated that weight control intentions were most strongly associated with endorsement of the social and aesthetic consequences of obesity ($B=0.117$, $t_{104}=2.314$, $p<0.05$) and rejection of the costs and barriers of weight control ($B=0.088$, $t_{104}=2.273$, $p<0.05$). Participants had low levels of knowledge about obesity's health risks and neither ORKS-10 scores nor HBen scores were associated with intentions. Health promotion might, therefore, benefit from focusing upon obesity's non-health impacts and the costs and barriers of weight control. Future obesity outcome expectancies research will also profit from the availability of psychometrically sound measures.

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CHAPTER ONE: INTRODUCTION TO OBESITY

1.1 CHAPTER ONE INTRODUCTION

According to the World Health Organization "... an escalating global epidemic of overweight and obesity – "globesity" – is taking over many parts of the world" and "If immediate action is not taken, millions will suffer from an array of serious health disorders" [1]. This chapter aims to describe the way in which the health effects and prevalence of excess adiposity have combined to make obesity an important public health crisis for the UK. Despite the need for concerted action obesity is considered to be "...one of today's most blatantly visible – yet most neglected – public health problems" [1]. This chapter, therefore, also reviews the approaches that interventions for obesity treatment and prevention can take.

1.2 HEALTH RISKS & THE DEFINITION OF OBESITY

Body fat, or adipose tissue, contains adipocytes with collagenous and elastic fibres, capillaries, fibroblasts and extracellular fluid, and is located throughout the body [2]. Generally, adult men and women with average bodyweights have around 15-20% and 25-30% body fat, respectively [3]. Fundamentally, body fat accumulates when the energy excess created by a situation of chronic, positive energy balance is stored in adipocytes as triglycerides [4]. This adiposity can be accurately measured using techniques such as Dual Emission X-ray Absorptiometer (DEXA), Bioelectric Impedance (BIA) and Computerised Tomography (CT) scanning. However, as these techniques require specialised equipment and highly trained technicians, Body Mass Index (BMI) is often used in field and clinical situations as it is based on simple anthropometric measurements; height in centimetres and weight in kilograms [5] (Figure 1.1). Although BMI does not measure body composition directly, it is considered to represent a useful proxy as it has been shown to correlate highly with measures of body fat [6]. The extent to which BMI measurements reflect body fatness, however, varies among populations because it is unable to take into account individual differences in body composition, due to factors such as age, gender and race [5].

Adipose tissue represents the human body's principal energy reserve [7] and is thought to have evolved in order to help individuals survive periods of starvation [8]. In addition, it offers insulation and mechanical protection for the body and is considered to be an important endocrine organ involved in metabolism, the immune system, sexual development and fertility [9]. However, although adipose tissue plays a crucial role in the human body, it can accumulate to an extent that health may be adversely affected – a situation that defines the condition of obesity [5].

Figure 1.1 The Body Mass Index (BMI) [5]

> The Body Mass Index (BMI) is a measure of height-adjusted body weight, calculated from the equation:
>
> $$\text{BMI} = \text{body weight in kilograms} / (\text{height in metres})^2$$

Although other classifications exist, most notably in the United States obesity is often considered to represent the 85^{th} percentile of the population (27.8 kg/m^2 in men and 27.3 kg/m^2 in women), the most widely accepted system is The World Health Organization's classification of overweight for adults in which obesity is classified by a BMI $\geq$ 30.0 kg/m^2 [5] (Table 1.1). Although the WHO categorisation is essentially arbitrary, it is based primarily upon the relationship between BMI and mortality [5, 10]. In addition, The World Health Organization's graded classification of overweight for adults also describes the level of risk for co-morbidity conferred by each class of overweight (Table 1.1). Some authors have contended that, because it only confers a greater probability of adverse future events, obesity should not be described as a disease [11]. Others, however, are of the opinion that "...careful clinical evaluation will nearly always elicit significant symptoms and signs" (p1406, [12]).

The relationship between degree of overweight categorised by BMI ranges and risk to health is not, however, a simple one. Firstly, several important confounding factors have been identified in addition to the problems created by the variable relationship between BMI and body fat. The level of risk conferred by a particular BMI may be influenced by factors associated with adiposity, such as the age of onset, duration, weight fluctuation patterns - both weight gain and weight loss - and the regional distribution of body fat; factors associated with the genetic predisposition to develop certain diseases such as ethnicity and gender; age; and factors associated with both weight and health such as smoking, diet and physical activity [5].

Table 1.1 Classification of overweight adults according to BMI [5]

Classification	BMI (kg/m^2)	Risk of co-morbidities
Underweight	< 18.5	Low (but risk of other clinical problems increased)
Normal range	18.5 - 24.9	Average
Overweight	≥ 25	
Pre-obese	25.0 – 29.9	Increased
Obese class 1	30.0 – 34.9	Moderate
Obese class 2	35.0 – 39.9	Severe
Obese class 3	≥ 40.0	Very severe

N.B. these BMI values are age-independent and the same for both sexes. However, BMI may not correspond to the same degree of fatness across different populations due, in part, to different body proportions.

This table shows a simplistic relationship between BMI and risk of co-morbidity which can be affected by a range of factors, including nature of the diet, ethnic group and activity level. The risks associated with increasing BMI are continuous and graded, and begin at a BMI below 25. Interpretation of BMI grading in relation to risk may differ for different populations.

In addition, assessing the impact of weight loss in populations can often be problematic as the number of adults who maintain weight loss in the long term (more than 2 years) is often limited [5]. Whether weight loss is intentional or not ideally needs to be considered, as unintentional weight loss may be disease-related, leading to an underestimation of the risk reduction associated with weight loss [13]. Even so, weight change over the study period may not be as stable as suggested by a simple intentional/unintentional classification. The results may be influenced by weight 'cycling' during the course of the study: periods of intentional weight loss followed by periods of unintentional weight gain [5]. Secondly, due to the ethical implications of experimental studies on humans, the influence of obesity on health has primarily been investigated using prospective cohort and cross-sectional population-based studies, which do not provide complete evidence for causality. However, as Barker, Cooper and Rose point out, the case for causality is strengthened if an association is shown to be strong, graded, independent, consistent, reversible, confirmed by animal models and has a plausible mechanism [14].

Unfortunately, rigorous systematic reviews that synthesize evidence from epidemiological, animal model, biochemical, physiological and clinical studies that investigate obesity's association with co-morbidity have not been conducted. Despite this, and the difficulties in evaluating the health consequences of obesity outlined above, there is a widespread, international consensus among the scientific and medical community that obesity is a significant risk factor for a number of life-threatening and debilitating physical conditions; including cardiovascular disease, hypertension, insulin resistance, type 2 diabetes mellitus, certain types of cancers such as colorectal and post-menopausal breast cancer, several endocrine and metabolic disturbances, gallbladder disease, osteoarthritis, gout and pulmonary diseases (e.g. [15-17]). Others have gone further and estimated the increased risk for the obese of developing associated diseases (e.g. [5, 18-20]). While it is beyond the scope of this introduction to fully explore the evidence implicating obesity as a significant health risk factor, selected primary evidence, consensus statements and relative risk estimates for several of the most significant comorbidities are presented in Appendix One.

In addition to objective measures of obesity's health impact such as premature mortality and conditions such as colon cancer or type 2 diabetes mellitus, it is important to consider the wider impact on health as defined by the World Health Organization; '...a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' [21]. Although there is no universally accepted definition of health-related quality of life (HRQL) it generally describes the individual's subjective evaluation and reaction to health or illness, taking into account physical, social and psychological well-being [22, 23]. A review of thirteen cross-sectional studies and one longitudinal study - which the authors deemed to be a representative sample of methodologically sound studies - concluded that obese individuals exhibit significantly impaired HRQL and that there is a positive relationship between HRQL and obesity [24]. A causal role for obesity is supported by data from a number of intervention studies which suggest that weight loss in both severely and mild-to-moderately obese patients precedes improvements in HRQL [24]. There is also some evidence to indicate that each unit of weight regain, following weight loss during a drug and dietary intervention, reduced HRQL to the same degree that each unit of weight loss improved HRQL [25]. Overall, although obesity affects both physical and psychosocial domains of HRQL, it appears to have a greater impact on physical functioning than mental functioning [24].

Although obesity appears to have an important impact on health-related quality of life, the available evidence suffers from some major limitations. Without a consensus as to what HRQL represents and the development of reliable, valid standardised measures, study outcomes will remain difficult to compare [24]. In addition, care should be taken with evidence from many of the available studies, as they are conducted on treatment-seeking individuals who are likely to be unrepresentative of the general obese population. For example, it has been reported that even when controlled for possible confounding factors, obese individuals seeking treatment from a university-based outpatient weight management clinic, showed a higher prevalence of obesity-related comorbidities and significantly impaired quality of life, in terms of bodily pain, general health and vitality, compared to obese individuals who were not actively seeking treatment [26].

In addition to physical health consequences, obesity has been linked to a number of psychological and social impacts, although the evidence to date is less convincing than that for physical health. In a review of the literature regarding the effects of obesity on attitudes and behaviour of others, Puhl and Brownell suggest that, while the available evidence often suffers from methodological limitations such as poor control of confounding factors, the use of self-reported measures of outcome and unrepresentative sampling, there is sufficient evidence to support the association between obesity and bias and discrimination [27]. The authors claim that while more research is required to investigate the true scope of this issue, obesity has been clearly and consistently associated with bias and discrimination in employment, education and health care settings [27]. In addition, it has been suggested that negative attitudes and the behaviour of others may have important mental health implications for obese individuals [28]. A clear relationship between obesity and psychopathology, however, has yet to emerge. The first generation of studies described by Freidman and Brownell, i.e. cross-sectional investigations of depression and Body Mass Index in the general population, revealed inconsistent results which led to a second generation of studies that recognised the heterogeneity of the obese population and aimed to identify potential risk factors for psychopathology [29]. A list of potential moderators and mediators of the relationship between obesity and depression have been presented by Stunkard, Faith and Allison which includes severity of obesity, gender, socioeconomic status as moderators and disordered eating and stress as mediators [30]. This model highlights the potentially dynamic relationship between obesity and depression; an issue addressed to some extent in three longitudinal studies which revealed that obesity precedes depression in adolescent girls, but not boys and older adults [28]. Although further systematic research is warranted to fully delineate this relationship, it remains the conviction of some authors that obesity is not strongly associated with psychopathology [28].

Despite the severity of obesity's impact on health, obesity-related diseases can be treated and the most cost-effective method of achieving this is through weight loss [31]. Modest weight reductions of 5% to 10% of initial body weight improve the metabolic disorders associated with obesity by reducing insulin, blood pressure, fatty acids and triglycerides, reverses insulin resistance, protects against certain cancers, and improves or reverses obesity-related co-morbidities, including osteoarthritis, diabetes and cardiovascular disease [31]. It can also produce immediate and significant improvements in an individual's sense of well-being, self-esteem, energy level and quality of sleep [31]. In view of this evidence, The Royal College of Physicians suggests that the primary goal of obesity treatment should be a weight reduction of 10% of the initial body weight although a reduction of 5% should be considered successful [32]. Similarly in the US, the National Heart, Lung and Blood Institute and the National Institutes of Health recommend that the initial goal of weight loss therapy should be a 10% reduction of body weight and that a reasonable time line for this, is 6 months [15].

1.3 OBESITY – THE UK'S PUBLIC HEALTH CRISIS

Considering the physical and psychosocial impacts associated with obesity, it is of particular concern to note that, in the UK, data from 2002 suggests that 70% of men and 63% of women are overweight or obese, according to the WHO classification system, and that 22% of men and 23% of women are obese [33]. It has been estimated that in 1998 there were over 18 million days of medically certified sickness absences in England attributable to obesity and its consequences [18]. Furthermore, in 1998 30,000 deaths in England were attributable to obesity which accounted for approximately 6% of all deaths in that year [18]. The World Health Organization has estimated that in countries such as the UK, which have a very low child and adult mortality rate, overweight results in 7.4% of the Disability-Adjusted Life Years (the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability), making it the fifth leading risk factor in the burden of disease [34]. Adult obesity and its consequences are estimated to have cost the NHS £480 million to treat during this period and the condition is estimated to have had an impact on the wider economy of £2.6 billion through reduced work-force productivity, that is 0.3% of UK Gross Domestic Product [18].

Although currently concerning, this situation is likely to deteriorate as the prevalence of obesity is increasing throughout the world at what has been described as an 'alarming' rate [5]. In the UK, obesity has risen by 9% in men and 7% in women between 1993 and 2002 and, if current trends continue, it is conservatively estimated that at least one-third of adults will be obese by 2020 [16]. Obesity, therefore, clearly represents a major public health crisis and is in need of immediate and concerted action in terms of both treatment and prevention.

1.4 THE DETERMINANTS OF OBESITY & TREATMENT / PREVENTION APPROACHES

As previously mentioned, adiposity fundamentally develops as the result of a state of chronic energy imbalance, in which energy intake exceeds the energy expended during normal bodily functions (resting metabolic rate), eating (thermic effect of food) and physical activity [8]. In terms of energy intake, eating behaviour can be defined as the consumption of "...energy as food and drink that can be metabolised inside the body." (p104, [5]). More specifically, eating behaviour includes responses such as the initiation and cessation of energy intake and diet composition. Behaviour related to energy expenditure is described as physical activity and has been defined as "...any bodily movement produced by skeletal muscle that results in a substantial increase over the resting energy expenditure" (p113, [5]). Physical activity includes activities undertaken during the course of work (occupational work), activities undertaken as part of day-to-day living (household and other chores) and activities undertaken in the individual's discretionary or free time, including exercise and sport (leisure-time physical activity) [5]. Considering that physical activity is thought to account for between 20 and 40% of daily energy expenditure [8], it is clear that behaviour plays a pivotal role in the development of obesity. Indeed, changes in eating patterns and increasingly sedentary lifestyles are considered the most likely explanation for the increasing rates of obesity in the UK [18] and the World Health Organization claims that "...obesity is a serious disease, but its development is not inevitable. It is largely preventable through lifestyle changes" (p4, [5]). However, the factors that determine these eating and physical activity behaviours have important implications for how obesity prevention and treatment is approached.

Despite the relatively simple underlying disease process, obesity is considered to have a complex, multifactorial aetiology. Positive energy balance is thought to be influenced by a range of interacting factors, affecting energy intake and/or energy expenditure via physiological regulatory and behavioural mechanisms [35]. It is considered that, in the majority of human obesity, no single factor is solely responsible for obesity and that the relative contribution of individual factors differs between individuals. In this way, obesity does not have to be considered as a single, discrete disorder but can be viewed as a group of heterogeneous disorders [36].

Although obesity is a feature of single gene disorders such as Prader-Willi syndrome [36], the vast majority of human obesity does not exhibit a clear pattern of Mendelian inheritance [37]. The 11th update of the human obesity gene map suggests that over 600 genes, markers and chromosomal regions have been implicated and that it is likely that, when false positives are accounted for, as many as 30 genes contribute to obesity risk [38]. The relative contribution of genetic determinants in the aetiology of positive energy balance is thought to occur along a spectrum, so that certain individuals are more susceptible to the development of obesity than others [35]. Family, twin and adoption studies, attempting to quantify the relative contribution of genetic factors to the population variation of obesity, have produced a range of heritability estimates from around 30% to 90% [37]. Although these estimates differ substantially, it is generally considered that they all confirm the presence of a strong genetic influence in the majority of human obesity [36]. Taking only the data generated from monozygotic twins reared apart, Ravussin and Bogardus have suggested that 40% of the 67% of BMI variability that can be attributed to genetic factors is due to hyperphagia and low activity [39]. The expression of genetic susceptibility to obesity depends largely upon an environment in which there are opportunities to consume excess calories and engage in low levels of physical activity – a gene-environment interaction. Or, as Bray and Champagne eloquently state, "...genes load the gun and a permissive, toxic environment pull the trigger" (pS21, [40]). Until further developments are made in the field of genetics, manipulating the environment would, therefore, seem to represent a key task of obesity prevention and treatment strategies. This approach would very much transfer responsibility for obesity away from the individual, who cannot 'help themselves', to medical science and society as a whole.

Conversely these same heritability estimates suggest that between 10% and 70% of the population variation of obesity cannot be explained by genetic factors. This stance is supported by analysis of epidemiological studies, such as the National Health Examination Surveys from the United States [41], which have indicated that the prevalence of obesity in certain populations has increased at a rate which cannot be fully explained by evolution [42]. Although weight gain can be promoted by certain therapeutic drugs, disease states, viruses and toxins, these are relatively rare situations [5, 40]. Ravussin and Bogardus have accordingly described this non-genetic contribution to BMI variability as "...the result of bad behaviour, or so-called 'sloth and gluttony'." (pS17, [39]). This behaviour has been described as 'bad' or 'sinful' because it is considered to be under an individual's voluntary control and, therefore, the individual is free to participate or not.

While environmental manipulation of the opportunities to consume excess calories and engage in low levels of physical activity would inhibit the expression of both genetic and non-genetic determinants of obesity, it is controversial. For example, in the White Paper 'Choosing Health: making healthier choices easier', the current UK government claims that 88% of the 150,000 individuals surveyed during the consultation agreed that individuals are responsible for their own health [43]. They go on to claim that "People do not want to be told how to live their lives or for Government to make decisions for them" (Chapter 1, Section 14 [43]). This assertion is also supported by academic research; for example, Evans *et al.* [44] demonstrated that US adults were generally opposed to regulatory or tax-based strategies to reduce childhood obesity. Responsibility for obesity, therefore, is placed back on the individual.

It is, however, clear that comparing environmental and individual approaches is not entirely straightforward. Making a particular healthful choice requires the opportunity to enact that choice; for example, in order to eat a salad rather than a pie, a salad must be available. However, individuals can alter their degree of exposure to obesity-promoting environments. For example, choosing their 'personal food environment' [45] so that s/he is in a restaurant that serves salads. Similarly, in a democratic society, macro environmental changes that offer the opportunity to engage in healthful behaviours, such as building safe cycle paths, will only come about if individuals make the appropriate political choices.

The important role of the individual's voluntary behaviour is also evident in the clinical situation. To a certain extent responsibility is transferred away from the individual by nutritional therapies, such as meal replacements and very-low-calorie diets, and exercise-on-prescription initiatives, in which food and physical activity environments are manipulated by health practitioners. Similarly, pharmacological and surgical treatment options for obesity, administered by health practitioners, manipulate the involuntary responsiveness to the environment. However, as The Scottish Intercollegiate Guidelines Network's guidelines for the management of obesity states, in order to sustain the reduction in weight produced by any treatment, the individual must make some fundamental changes in their obesity-related behaviour [46]. For example, individuals must adhere to their medication regimen despite the possible unpleasant side-effects or the often radical post-surgical dietary changes.

Although it is clear that individual approaches have a key role to play in the prevention and treatment of obesity, it is extremely important to recognise that an obese individual cannot be held solely responsible for their bodyweight. Individual approaches, however, do not have to create a culture of blame. Instead, with the appropriate level of support, they have the potential to empower individuals to not only change their own behaviour but also to change their environment [47].

1.5 CHAPTER ONE SUMMARY

The condition of obesity, classified by a BMI ≥ 30.0 kg/m^2, is a state of excess adiposity and a risk factor for a wide range of significant physical, psychological and social problems. As the prevalence of obesity is currently high and set to increase in the future, immediate and concerted action is required. Individuals can exert volitional control over their eating and physical activity behaviour and their environments and, therefore, have an important role to play in treating and preventing obesity.

CHAPTER TWO: INTRODUCTION TO OUTCOME EXPECTANCIES

2.1 CHAPTER TWO INTRODUCTION

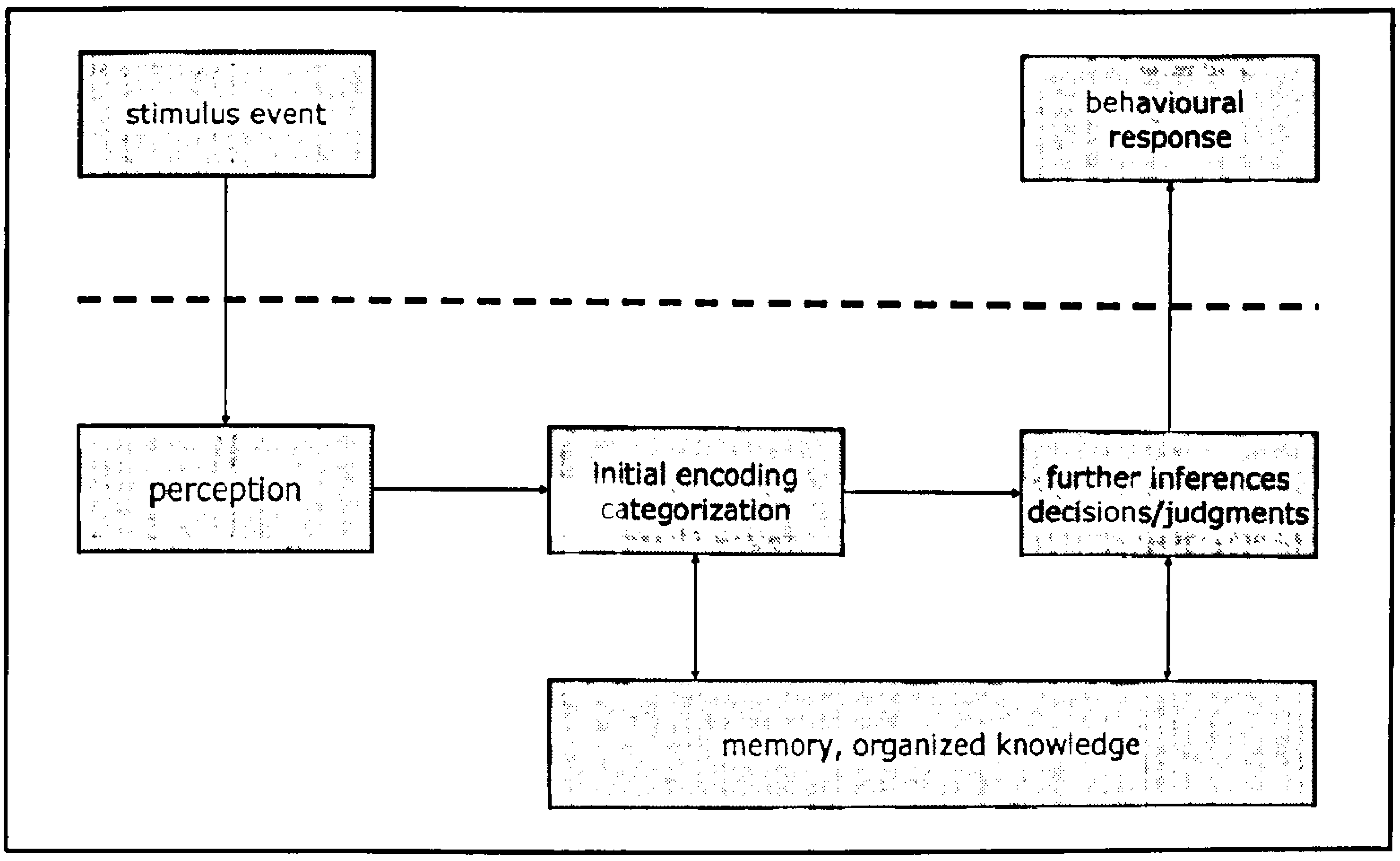
As discussed in Chapter One, individuals have an important role to play in tackling the global epidemic of obesity. This chapter aims to review how cognitions - attitudes, beliefs and knowledge - are thought to determine individuals' health behaviour and describe the central role of outcome expectancies. This chapter will also review in detail, the assessment of outcome expectancies using psychometric scales and discuss the importance of creating reliable and valid measures.

2.2 SOCIAL COGNITION THEORY

In contrast to the behaviourist approach, social cognition theory suggests that behaviour which occurs in a social context, including eating and physical activity, is not directly determined by the external stimulus of a situation, but by mediating internal mental processes [48]. It has been argued that, while the ways in which situations are perceived cannot be measured objectively, unlike the external stimuli and overt behaviour, these 'hidden links' make it possible to explain the wide range of human behaviour that cannot be fully explained by biological requirements [48].

The mediating cognitive processes described by social cognition theory have been organised into a series of distinct, although interconnected, theoretical stages (Figure 2.1) [48]. The initial requirement is for the stimulus event to be recognised, or perceived, by the individual. This perception is then interpreted and given some meaning through an encoding process. The means by which the perceived stimulus is encoded depends in part on the individual's prior knowledge and experience which is stored in the memory. In turn, this newly encoded perception will itself become knowledge, be stored in the memory and may be used in the assessment of future events. It is the combination of the encoded stimulus and the stored prior knowledge which provides the basis for further processing and the formation of inferences, judgements and decisions. It is from these decisions that a behavioural response *may* then arise.

Figure 2.1 Sequence of information processing (adapted from Bless, Fiedler & Strack, 2004 [48])



The mediating mental processes described by social cognition theory allow individuals to "...enact their self-conceptions, revise their behaviour, or alter the environment so as to bring about outcomes in it in line with their self-perceptions and personal goals." (P181, [49]). Gollitzer's Model of Action Phases goes on to delineate this process of self-regulation into four separate, consecutive stages; the pre-decisional, pre-actional, actional and post-actional phases [50]. Firstly, the pre-decisional, motivational phase involves individuals deciding which of their, potentially many, wishes are the most salient. Saliency is determined by the wish's feasibility and by the extent to which the expected outcomes of the wish are considered desirable. When a wish is considered to be salient, it can go on to form a 'binding goal' towards which the individual feels some kind of commitment to fulfil. Once this decision to act has been made, the individual enters the pre-actional, planning phase in which decisions regarding the initiation of the behaviour required to achieve the set goal are made. These implementation intentions commit the individual to perform a particular behaviour when a particular situation is encountered. Once the implementation intention has been enacted, i.e. the behaviour is initiated, the individual enters the actional phase. This requires the individual to respond to any opportunities or problems which occur as they engage in the behaviour in order to bring it to a successful conclusion. The final, post-actional phases require the individual to reflect upon and evaluate their behaviour in order to determine whether or not it was sufficient to achieve the set goal.

In the information processing sequence described in Figure 2.1, an object is given some meaning when it is associated with various characteristics. These encoded perceptions, or beliefs, have been defined as the "...subjective probability of a relationship between the object of the belief and some other object, value, concept or attribute." (p131 [51]). In keeping with the theoretical sequence of information processing described in Figure 2.1, beliefs can be formed from a combination of three processes; in response to direct observation of the object and it's attributes (*descriptive beliefs*), from some other existing belief(s) (*inferential beliefs*), and/or from information provided by some external source (*informational beliefs*) [51]. Furthermore, a belief can be considered to be knowledge if an accepted body of evidence exists against which it can be judged 'true' or 'false'. Accurate knowledge can, therefore, be conceptualised as 'justified true belief' [52]. While a belief can be held with various degrees of intensity, knowledge is an absolute – it cannot be more or less true, it is either true or it is not.

It is thought that during the process of association, attitudes towards that object are automatically and simultaneously acquired [53]. Attitudes are thought to represent a function of a) the beliefs regarding the attitude object's attributes and b) an evaluation of these attributes and have been described as "...a state of readiness, a tendency to respond in a certain manner when confronted with certain stimuli" (p174 [54]).

As Conner and Norman point out, there is a sound justification for focusing on these mediating internal mental processes as a means of promoting health behaviour change as, not only are social cognitions considered to be important proximal determinants of behaviour, they are relatively open to modification compared to other psychological factors such as personality [55]. While sociodemographic characteristics have been shown to represent significant distal determinants of health behaviour, their effect is thought to be mediated, in part, by these internal mental processes.

2.3 PREDICTING HEALTH BEHAVIOUR: THE CENTRAL ROLE OF OUTCOME EXPECTANCIES

Both Expectancy Value (EV) Theory [56] and Subjective Expected Utility (SEU) Theory [57] suggest that a behaviour is more likely to occur if the outcomes associated with that behaviour are positively evaluated by the individual and less likely to occur if negatively evaluated. This evaluation is thought to be the product of outcome expectancies, i.e. beliefs regarding the likelihood that this outcome will occur and beliefs regarding the value of the outcome. When the evaluations of the most salient outcomes of a behaviour, both positive (benefits) and negative (costs), are combined, the overall utility, or desirability, of that behaviour is produced [55] (Figure 2.2).

Figure 2.2 Subjective Expected Utility Theory (adapted from Conner & Norman, 1996 [55])

$$SEU_j = \sum_{i=1}^{i=m} P_{ij} \,.\, U_{ij}$$

Note. SEU_j = subjective expected utility of a behaviour j; P_{ij} = perceived probability of outcome i of action j; U_{ij} = subjective utility or value of outcome i of action j; m = number of salient outcomes.

It is thought that individuals will generally prefer the behaviour with the highest utility so that the adoption of a health-protective alternative is more likely if the utility of an alternative behaviour is higher than the utility of the current behaviour (Figure 2.3).

Figure 2.3 The prediction of health-protective alternative behaviour using Subjective Expected Utility Theory

$PRE_A = SEU_A - SEU_C$

(where $SEU_A = BEN_A - COST_A$; $SEU_C = BEN_C - COST_C$)

Note. PRE = prediction of behaviour; SEU = subjective expected utility of the behaviour; A = health-protective alternative behaviour; C = current behaviour; BEN = benefits associated with the behaviour; COST = costs associated with the behaviour.

Although Figure 2.3 presents the benefits and costs of both the current and alternative behaviours as distinct variables, not receiving a perceived benefit of one behaviour can also be considered a cost of engaging in its alternative. It can, therefore, be easier to conceptualise if the formula present in Figure 2.3 is rearranged in terms of a simple cost-benefit analysis, where the benefits of the alternative behaviour and the costs of the current behaviour are weighed against the benefits of the current behaviour and the costs of the alternative behaviour (Figure 2.4).

Figure 2.4 The prediction of health-protective alternative behaviour using a cost-benefit analysis

$$PRE_A = (BEN_A + COST_C) - (BEN_C + COST_A)$$

Note. PRE = prediction of behaviour; A = health-protective alternative behaviour; C = current behaviour; BEN = perceived benefits associated with the behaviour; COST = perceived costs associated with the behaviour.

Outcome expectancies and the cost-benefit analysis are thought to play a central role in the pre-decisional, motivational phase of self-regulation and have been incorporated, along with a number of other theories, into the most widely used social cognition models (SCMs); the Health Belief Model and the Theory of Reasoned Action and its predecessor, the Theory of Planned Behaviour [55].

For example, according to the Health Belief Model (HBM), the likelihood that an individual takes a recommended preventive health action is determined by a core set of beliefs which focus upon threat perception and outcome expectancies [58]. The perception of threat is thought to be the product of beliefs regarding *perceived susceptibility* (i.e. the individual's subjective perception regarding the risk of experiencing a negative health event) and *perceived severity* (i.e. the anticipated seriousness of the consequences, both medical and social, associated with such a negative health event) [59]. The evaluation of the recommended behaviour is thought to be produced when the *perceived benefits* of carrying out the recommended behaviour (i.e. it's effectiveness in reducing the perceived threat) is weighted against the *perceived barriers* to taking action (i.e. any negative effect of the recommended behaviour including the loss of positive outcomes of the current behaviour) [59]. It is assumed that various demographic (e.g. age, sex, ethnicity), sociopsychological (personality, social class, peer and reference group pressure) and structural variables (e.g. knowledge about the health threat) have the potential to influence threat perception and behavioural evaluation and, therefore, have an indirect influence on behaviour [59].

In addition to these cognitive variables, it is suggested that an instigating event (*cue to action*) is necessary in order to trigger health behaviour where appropriate beliefs are held. It is suggested that the perception of threat provides the driving force for action, the behavioural evaluation provides the preferred path of action and the cue to action sets the process in motion [59]. There are a huge number of potential cues to action which can be either internal (e.g. experience of symptoms) or external (e.g. exposure to health education) [59]. Since the original model was developed, several other variables have been considered for inclusion, most notably a health motivation variable which refers to an individual's readiness to be concerned about health issues [58].

The precise way that the four cognitive variables of the original HBM combine in order to predict behaviour is not specified, leading to it being described as "...a loose association of variables that have been found to predict behaviour [rather] than a formal mode" (p24, [60]). However, according to Weinstein [61], in most studies an additive combination is assumed and so the HBM predicts health-protective behaviour using the formula outlined in Figure 2.5.

Figure 2.5 Prediction of health-protective behaviour using the Health Belief Model (adapted from Weinstein, 1993 [61])

$$PRE_A = w_1PROB_c + w_2SEV_c + w_3EFFECT - w_4COST$$

Note. PRE_A = prediction of health-protective alternative behaviour; PROB = perceived probability that a particular health outcome will occur; SEV = perceived severity of a health outcome; c = health consequences under current behaviour; EFFECT = perceived effectiveness of the precaution; COST = perceived costs and barriers to action; w_1, w_2, w_3, w_4 = parameters (>0) to be determined empirically.

As the name suggests, the HBM focuses on beliefs regarding the health outcomes of the behaviours in question. In Figure 2.5, the variables $PROB_c$ and SEV_c specifically refer to beliefs regarding the health threat associated with the current behaviour while EFFECT refers to beliefs regarding the effectiveness of the alternative behaviour in reducing that health threat. The only variable in Figure 2.5 to consider non-health beliefs is the variable COST which refers to beliefs regarding *any* negative outcome or barrier associated with the alternative behaviour and, implicitly, *any* positive outcome of the current behaviour. While the formula present in Figure 2.5 does agree with the cost-benefit model presented in Figure 2.4 if the variables $({}_{w1}PROB_c + {}_{w2}SEV_c) + ({}_{w3}EFFECT) = (COST_c) + (BEN_a)$ and ${}_{w4}COST = (BEN_c + COST_a)$, this model does not take into account the potential non-health costs of the current behaviour and the non-health benefits of the alternative behaviour. This is an extremely important consideration for, as Stroebe points out, even health-enhancing behaviours are frequently undertaken for reasons unrelated to health [62]. Although the HBM 'perceived benefits' and 'perceived costs' constructs are strongly associated with behaviour across a range of health contexts [63], behaviours such as weight control, which may be motivated by concern regarding attractiveness as well as obesity-related comorbidities, might be more strongly predicted if non-health related outcome expectancies were more fully considered.

In contrast to the HBM, the Theory of Reasoned Action (TRA) incorporates the costs and, implicitly, the benefits of both health and non-health outcomes. The TRA suggests that behaviour is affected by behavioural intentions which, in turn, are influenced by the overall evaluation of the behaviour (*attitudes towards behaviour*) and beliefs about whether most people approve or disapprove of the behaviour (*subjective norm*) [51]. In accordance with SEU theory, the overall evaluation of the behaviour is the product of beliefs regarding the likelihood that the salient outcomes will occur (*behavioural beliefs*) and beliefs regarding the value of these outcomes (*evaluations of behavioural outcomes*). Subjective norms are described as the product of beliefs about whether each referent approves or disapproves of the behaviour under consideration (*normative belief*) and the motivation to do what each referent thinks (*motivation to comply*) [64]. The Theory of Planned Behaviour (TPB) is seen as an extension to the TRA as an additional variable influencing behavioural intention, *perceived behavioural control*, is added (e.g. [65]). The overall perception of control over the behaviour in question is thought to be the product of beliefs regarding the presence or absence of facilitators or barriers to the performance of the behaviour (*control beliefs*) and beliefs regarding the impact of each of these factors on the behaviour, either positive or negative (*perceived power*) [64]. According to Weinstein (1993), the original TRA predicts health-protective behaviour using the formula shown in Figure 2.6. This formula best agrees with the cost-benefit model presented in Figure 2.4 as the variables ($PROB_cSEV_c$ + $\Sigma_{c'}PROB_{c'}VALUE_{c'}$) = ($COST_c$ + BEN_a) and ($PROB_aSEV_a$+ $\Sigma_{a'}PROB_{a'}VALUE_{a'}$) = ($COST_a$ + BEN_c) and, across a range of health behaviours, the TRA/TPB 'attitudes' construct significantly predicts intentions to engage in behaviour [66].

Figure 2.6 Prediction of health-protective behaviour using the Theory of Reasoned Action (adapted from Weinstein, 1993 [61])

$$PRE_A = PROB_cSEV_c - PROB_aSEV_a - COST_{TRA}$$

(where $COST_{TRA} = \Sigma_{a'}PROB_{a'}VALUE_{a'} - \Sigma_{c'}PROB_{c'}VALUE_{c'} - \alpha\Sigma[(NB_{a,k} - NB_{c,k})MC_k]$)

Note. PRE_A = prediction of health-protective alternative behaviour; PROB = perceived probability that a particular health outcome will occur; SEV = perceived severity of a health outcome; c = health consequences under current behaviour; a = health consequences under alternative behaviour (the precaution); VALUE = perceived value of a nonhealth outcome; a' = consequences of alternative behaviour other than health effects; c' = consequences of current behaviour other than health effects; NB = normative beliefs (strength of desire of another person that the individual perform a particular behaviour); MC = motivation to comply with the other person's desire; k = various individuals whose desires might influence behaviour, w_1, w_2, ..., α = parameters (>0) to be determined empirically.

Outcome expectancies are also implicated in the Transtheoretical Model (TTM) which was developed by Prochaska and colleagues in order to integrate processes and principles from a range of psychotherapy and behaviour change theories [67]. Although it primarily represents a model of behaviour change, it also provides a model for understanding health behaviour [68].

According to the TTM, individuals can be assigned to a number of stages; precontemplation – not thinking about change or suppressing thoughts about change; contemplation – considering making changes but taking no action; preparation – anticipating making efforts to change and considering what behaviour one will do; action – actually engaging in efforts to change; and maintenance – expending effort to retain the changes made during action [68].

A literature review of studies across twelve health behaviours has demonstrated that stage of change is consistently associated with pros and cons and that relationship between stage and decisional balance suggests that in order to progress from precontemplation, the pros of changing must increase; to progress from contemplation, the cons must decrease [69]. Further analysis has suggested that progress from precontemplation to action involves approximately a one standard deviation increase in the pros of changing and a 0.5 standard deviation decrease in cons [70]. Several cognitive processes by which progression between stages is mediated have been suggested; for example consciousness raising in order to increase pros and aid progression from precontemplation to contemplation [67].

Decisional balance, the relative weighing of the pros and cons of changing behaviour is, therefore, a central construct of the TTM and, as Noar and Zimmerman point out, outcome expectancies and decisional balance are likely to be highly correlated [71]. Indeed, responses from decisional balance inventories have been used to provide construct validity for outcome expectancy scales (e.g. [72]). There is, however, as yet little empirical evidence to support this contention [71].

Despite the amount of research that utilises health behaviour theories such as the HBM and the TPB [71], at the present time no one theory or SCM dominates research or practice [60]. Although the TPB appears to have emerged as the SCM with the best predictive power [73], the majority of variance in intentions and behaviour remains unaccounted for [74]. In order to advance health behaviour theory, it has been suggested that rather than create a fragmented literature using the range of different models, an integrative approach should be employed [71, 73]. Fishbein, for example, has created an integrative model from a number of leading SCMs which clearly states the role of *'behavioural beliefs and their evaluative aspects'* [75]. However, in order to integrate models [73] or, as Noar and Zimmerman suggest, to empirically compare SCMs [71], individual constructs such as outcome expectancies need to adequately assessed.

2.4 THE ASSESSMENT OF OUTCOME EXPECTANCIES

2.4.1 PSYCHOMETRIC SCALES

In order to investigate individual differences in psychological characteristics such as outcome expectancy cognitions, it is necessary to quantify the constructs of interest. However, as discussed in Section 2.2, cognitions are by their very nature unobservable and so measurement most often relies upon self-report, where participants respond in a verbal or written manner to statements regarding the object in question, e.g. interviews and self-completed questionnaires. In this way, the language of the question or statement is used to trigger or activate the cognition in order to measure it.

Quantitative measures of psychological characteristics are frequently, and often appropriately, referred to interchangeably as questionnaires, tests and scales, although some distinctions can be made [76]. Perhaps the most important distinction to make is whether the instrument is structured or unstructured. The items involved in unstructured questionnaires are statistically unrelated and, therefore, represent individual measures of the cognition of interest. However, the assumption that complex constructs such as cognitions can be reliably assessed using a single item has been called into question [54]. In order to accurately determine whether there are significant differences between subjects or changes over time, a psychological characteristic must be measured reliably, i.e. consistently, every time the scale is administered.

According to the classical theory of measurement[i], the score obtained from a measure is not only influenced by the psychological construct under investigation, the 'true' score, but also by other, unrelated factors or measurement errors (Figure 2.7) [77]. The accuracy with which the obtained score represents the true score therefore depends upon the impact of measurement errors. Error can take two forms - random and systematic. Random effects unpredictably affect scores and add inconsistency to the measure, reducing its reliability.

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[i]Throughout the 20th Century, test development has been dominated by classical test theory. This thesis also draws upon this established theory of measurement. It is, however, important to recognise that an alterative theory - item response theory - has been gaining popularity since its development in the 1960s. Although it is considered to represent a potentially useful method of constructing achievement tests, it is not universally accepted. This is mainly because the total test score is taken to represent the underlying trait against which the performance of the item is judged. This underlying assumption of complete unidimensionality is considered to be inappropriate for the majority of psychological constructs [77].

Figure 2.7 Factors influencing test scores according to the classical theory of measurement (adapted from Gregory, 2004 [77])

$X = T + e$

Where X is obtained score, T is the true score, and e represents errors of measurement.

An alternative to single item measures are sets of related items in which scores from each item are combined in some way to produce a single, overall score - referred to as structured questionnaires, psychometric tests, psychometric or psychological scales [76]. These help to minimise the impact of the random error associated with each item on the overall score and, therefore, improve reliability. However, according to measurement theory, reliability is not the only desirable property of a measure. An adequate scale will also be, as far as possible, devoid of systematic error - an attribute entitled unidimensionality. It will also measure what it claims to measure - an attribute termed validity. Paying attention to the psychometric properties of a scale is extremely important if meaningful results are to be produced. For example, as Conner points out, the inadequate operationalization of constructs may account for the poor predictive power seen by many studies looking to predict behaviours from cognitive variables [60].

To ensure that measures fulfil these important criteria, the test developer can develop an item pool and then employ statistical test construction techniques such as item analysis and/or factor analysis to select appropriate items. These can then be followed by studies seeking to establish the measures' validity.

2.4.2 DEVELOPING THE ITEM POOL

2.4.2.1 Content

2.4.2.1.1 Saliency to Construct

The item pool is required to represent a comprehensive sample of all possible items as it will be from this that items will be selected on the basis of their statistical properties to form the final scale. Input from colleagues, reviews of related scales and in-depth interviews or group discussions with relevant individuals are all sources of information which can guide the development of items in terms of their content. Using a range of informants can also provide alternative, engaging ways of expressing the construct in question [54]. Although this initial selection process is subjective, the appropriateness of the items is later established objectively when the item pool is piloted and statistically analysed. It is advantageous to pilot as many items as possible, although this needs to be balanced with the demand placed upon the respondent (respondent-load) and so it is recommended that at least twice as many items as are required in the final scale are piloted in the item pool [78].

2.4.2.1.2 Saliency to Respondent

In addition to being salient in terms of the construct under investigation, items also need to be perceived as relevant by respondents to ensure their continued engagement with, and ultimately, the success of the scale [54].

2.4.2.1.3 Language

In order to elicit an accurate response, and therefore minimise random measurement error, items need to be interpreted in a consistent manner. To avoid misunderstandings, items need to be clear and simple. The use of technical jargon, abbreviations, double-barrelled questions, and colloquial terms are just some of the, mostly common-sense, hazards which should be avoided when writing scale items [54]. The appropriateness of wording is, however, somewhat dependent upon the population for whom the scale is intended; a technical term may be appropriate for a scale intended for use among experts, for example 'myocardial infarction' would be more appropriate than 'heart attack' for a group of cardiologists, whereas local slang may be an engaging, vivid expression for a group of young people.

2.4.2.1.4 Readability

Although surprisingly not referred to by the leading texts on test construction (e.g. [77, 79]), the calculation of a readability estimate is a useful technique for ensuring that an item pool is written in appropriate language for the intended population. Readability formulas are regression equations which predict the difficulty of the text from characteristics such as word and sentence length and how common the words are in the whole of written language [80]. Several readability formulas are available but the Dale-Chall Formula and the Flesch Reading Ease Score have received most support [80] and the Flesch Formula has the additional advantage of being automated in Microsoft Word, although some doubts have been raised regarding the accuracy of automated readability estimates in complicated texts [81]. The Flesch Reading Ease Score is calculated using the formula presented in Figure 2.8 and can be interpreted in such a way that higher scores indicate more understandable texts [82]. To aid interpretation, Flesch Reading Ease Scores can be converted into corresponding Flesch Kincaid Grade Levels (Table 2.1) [82].

Figure 2.8 Flesch Reading Ease Score [82]

Reading Ease = 206.835 – 0.846W – 1.015S

Where W = average number of syllables per hundred words and S = average number of words per sentence.

Table 2.1 Flesch Kincaid Grade Levels [82]

Reading Ease Score	Verbal Description	Completed grade level required to understand
90 - 100	Very easy	4
80 - 90	Easy	5
70 - 80	Fairly easy	6
60 - 70	Standard	7-8
50 - 60	Fairly hard	
30 - 50	Difficult	
0 - 30	Very hard	

Although readability 'gold-standards' do not appear to exist for psychometric scales, it has been suggested that patient information leaflets should not exceed a readability age of 12 [83], which corresponds to a Flesch Reading Ease Score of 60 - 70. It is however, recommended that readability estimates are used with caution as poorly written text can still produce adequate readability scores [80]. It is also important to note that the use of medical terminology can inflate a scale's readability estimate, for example the use of 'osteoporosis' instead of 'thin bones' in Winzenberg *et al.*'s Osteoporosis Knowledge Assessment Tool (OKAT) [84]. However, the authors, along with others [81], make the point that long words can be widely recognised in the general population, thereby artificially inflating the reading age.

2.4.2.1.5 Response Sets

An additional source of measurement error is due to response sets. These represent the tendency of an individual to respond to the item in a particular manner which is not directly related to the item content [54]. One important example of this phenomenon is the social desirability response set where individuals tend to respond more positively if they believe that by doing so they will be subscribing to some socially acceptable quality. Using neutral wording, which does not unwittingly direct the individual to any particular response [54] and anonymity, are techniques that can help [85].

Another important response set is the acquiescence response bias; the tendency to respond positively to items [54]. This phenomenon can be controlled by creating a pool which is balanced in terms of positive and negatively worded items. For example, a respondent who agrees with the statement 'Smoking is damaging to health' would be expressing a positive attitude towards the harmful effects of smoking on health, whereas to express the same attitude when faced with the statement 'Smoking is not damaging to health', a respondent would need to disagree. As Kline points out, special attention needs to be paid to the generation of viable negatively-worded items [78]. For example, a less demanding alternative to 'Smoking is not damaging to health' could be 'It is healthy to smoke'.

2.4.2.2 Response Formats For Assessing Outcome Expectancies

2.4.2.2.1 The Assessment of Knowledge

The preferred response format for tests which measure skill or knowledge levels is often claimed to be multiple-choice (e.g. [77, 78]). Here the participant is presented with a question followed by a series of answers, although only one of the answers represents the correct response while the others serve to distract the participant. One of the most appealing characteristics of the multiple-choice response format is that it can reduce the impact of guessing. For a multiple-choice item with five possible answers, the likelihood that the respondent will select the correct answer by guessing is 20% if the distractors are equally well endorsed. Guessing is a significant problem for measures of skill or knowledge as it introduces random measurement error [78]. In contrast, an item which offers a true or false option to a statement will give the respondent a 50% chance of selecting the correct answer by chance. True-false response formats do, however, offer certain advantages over the multiple-choice format and are particularly appropriate for the measurement of detailed, factual knowledge [78]. One of the major difficulties with measuring skill or knowledge levels is the need to write items that can be unambiguously considered true or false without being trivial [78]. This can be particularly challenging for multiple-choice items which require, for example, five unambiguous, equally reasonable and non-leading answers to measure each item. The true-false response format reduces respondent load and is, therefore, quick and easy to complete. Several strategies are available to reduce the impact of guessing - one option is to ask respondents to select an 'uncertain' or 'don't know' option rather than guess at an item. In addition to minimising guessing, the 'don't know' option acknowledges that not every participant will have a clear response and, therefore, may help to avoid isolating individuals which is important as respondent motivation is essential to maximise response rates, and ensure accuracy [54]. If a 'don't know' option is used, the test constructor must decide on how this is to be scored; whether being unsure of the answer is 'better' than getting the answer wrong and is, therefore, given a higher score or whether 'don't know' is the same as getting the answer wrong so that they are scored equally. It is, however, important to note that the former option conflicts with the concept of knowledge as an absolute as discussed in Section 2.2.

There has, however, been some debate as to whether items that have a pre-designated range of options by which to respond (closed-response formats) such as multiple-choice and true/false items, represent the most appropriate measure of knowledge (e.g [86]). Closed-response items require the participant to compare the information presented in the question with a representation stored in the memory as discussed in Section 2.2; a process of recognition [87]. For example, Wardle and colleagues asked their participants 'I would like you to look down the list and tell me which things you think affect a person's chance of developing bowel cancer', followed by a list including 'older age' and 'smoking' [88]. Alternatively, an open-response item such as 'What do you think are the main things that increase a person's chance of developing breast/bowel cancer?' [89], requires the demanding process of recall. Here the retrieved representation, for example 'older age', is different from the information presented in the question [87].

As demonstrated by a comparison of these two items, higher knowledge scores can be produced by closed-response items [86]. However, it has been suggested that it is unprompted responses that are most relevant for risk factor knowledge [86]. Although preventive health behaviour is most likely to be determined by knowledge that, due to the lack of external cues, is easily accessible, in a climate of health promotion, this may be less relevant. Open-response items are also associated with a number of other limitations, for example compromising anonymity, possible interviewer bias, the subjectivity inherent in coding responses, the potential for floor effects and, importantly for large surveys, the considerable resources required.

Out of the available response formats, a closed-response item with a true/false/uncertain response format, therefore, appears to represent a reliable and user-friendly method of assessing detailed knowledge such outcome expectancies.

2.4.2.2.2 The Assessment of Beliefs

Methods of scaling have mainly been developed in the field of attitude measurement, although the principles are applicable, and widely used in the development of scales measuring other characteristics such as health beliefs that cannot be categorised as true or false [90]. Thurstone, Guttman and Likert scales are three of the main scaling methods which were all originally designed to measure attitudes by assessing the extent to which people express support or opposition for a number of carefully constructed statements. These statements express a belief about the attitude object which can be assessed in terms of whether endorsement represents a favourable or unfavourable sentiment of the construct in question [90]. There are also semantic differential scales which differ from Thurstone, Guttman and Likert scales as participants rate the object or person in question on a scale anchored at each end by an opposing adjective, for example:

Strong : .... : ....✓..... : .... : .... : .... : .... : .... : Weak

Although the relative simplicity of semantic differential scales reduces respondent load, it can lead to ambiguity, which is a potential source of measurement error. For example, in relation to a person, 'strong' could refer to physical strength and/or strength of character.

Despite the range of response formats available, Likert scales have emerged as the most popular scaling method [54, 78, 90]. In a Likert scale, the respondent is normally given a number of categories reflecting a continuum of endorsement to choose from, for example 'strongly agree', 'agree', 'uncertain', 'disagree', and 'strongly disagree'. As well as the traditional five-point scale, seven-point scales can be used to provide a higher level discrimination between scores, although it is suggested that nine is the maximum number of points after which no further value is conferred [78]. Test constructors also have the option to remove the neutral option to produce a scale with an even-number of categories, which has the effect of forcing the respondent to indicate some direction. The responses are then traditionally scored in such a way that a high score indicates a high level of the characteristic in question. The test constructor then decides whether the endorsement of an item indicates a favourable inclination and consistently scores the items appropriately i.e. 'strongly agree' = 5 to 'strongly disagree' = 1 when endorsement is favourable and 'strongly agree' = 1 to 'strongly disagree' = 5 if unfavourable. Scores from each item are then simply added together to produce the total scale score. Although this method of scoring requires the test constructor to subjectively evaluate the items, inappropriately scored items will be revealed when subjected to statistical analysis.

The major strength of Guttman scales over Likert scales is the reproducibility of scores. For example, a score of five on a reproducible scale from zero to 10 will always indicate that items 1-5 were endorsed, whereas on a non-reproducible scale a score of 5 could be produced by endorsing any combination of 5 items. However, reproducibility is not universally considered to represent an essential feature of psychological scales [54]. A disadvantage of this emphasis on reproducibility is that it tends to produce scales with very narrow content domains [54]. While homogeneity is an essential feature, scales with a highly narrow focus may lose their ability to measure the whole construct. In addition, although it is suggested that the emphasis on reproducibility ensures homogeneity [54], items may be successfully ordered in terms of their relative favourability, even if they have unrelated contents [78]. In addition, while scalogram analysis ensures that items that are closely associated (i.e. have low reproducibility) are excluded, this leads to the criticism that Guttman scales have limited discriminatory ability [78]. Similarly, Thurstone scales have also come under criticism, this time for their use of a panel of judges to evaluate the importance of item endorsement. This needs to be both sufficiently large (n>100) and representative of the population for which the scale is intended and is ultimately a subjective process [54].

In addition to being widely used and, therefore, presumably familiar to participants, Likert scales are easily constructed [78], understood and analysed [90], and allow the respondent higher degree of expression than Guttman and Thurstone scales. Likert scales have also found support within the literature, particularly for investigating cognitive theories [54, 78]. However, although Likert scales have emerged as a popular and useful scaling technique for constructs such as outcome expectancies, it is important to recognise that it can only ever, strictly speaking, produce ordinal-level data. For example, a 5-unit change in score between zero and five is not necessarily of the same magnitude as a 5-unit change in score between five and ten.

2.4.3 THE FACTOR ANALYTICAL METHOD OF TEST CONSTRUCTION

2.4.3.1 Introduction

Once an adequate item pool has been developed using the principles outlined in Section 2.4.2, it is important to administer the items to a pilot sample. The responses can then be tested statistically to ensure that the resultant measure is psychometrically sound and, as closely as possible, fulfils the requirements of the linear scaling model as discussed in Section 2.4.1.

Exploratory factor analysis is considered to represent a superior statistical test construction method as it produces unidimensional measures [78]. As discussed in Section 2.4.1, error can take two forms; random and systematic. Systematic measurement errors will affect the scale if, for example, the items consistently measure a second psychological characteristic alongside the one it is designed to assess, for example education level and knowledge. Although it may not be possible to create an exclusively unidimensional measure, factor analysis can ensure that it is adequately unidimensional by identifying those items from the item pool that group together in relatively independent sets [91].

2.4.3.2 Procedures

The process undertaken in factor analysis can be described as four stages; the computation of a correlation matrix, factor extraction, factor rotation, and factor interpretation. In his section on test construction methodology, Kline implies that factor analysis is a one-off process [78] although a more dynamic, interacting process is described by Tabachnick and Fidell [91]. They suggest that factor analysis can be repeated in several different ways until the most useful, interpretable solution is achieved [91].

2.4.3.2.1 Correlation Matrix

The first calculation in factor analysis involves the computation of a correlation matrix of all possible pairing of the items in a pool using the phi correlation coefficient for dichotomous items and Pearson product moment for items with a response scale [78].

2.4.3.2.2 Factor Extraction

Although there are a range of methods available to extract factors from the correlation matrix, the most commonly used techniques are principal components analysis (PCA) and principal factors analysis (PFA) [91]. While both of these techniques aim to extract factors which explain the maximum amount of variance, PCA achieves this by analysing all the variance in the observed variables while PFA analyses covariance and, therefore, attempts to eliminate the error and unique variance in order to reveal a clearer picture of the underlying processes determining the correlations between variables [91]. The significance of this distinction in approach is that the factors extracted by PCA, more accurately referred to as components, represent empirically derived sets of correlated variables, while the factors extracted by PFA represent underlying dimensions [91]. Although PFA may, at first glance, appear to be a more appropriate extraction method for the process of test construction than PCA, it must be remembered that the factors identified are theoretical as they are based on estimates of the actual variables. This reliance on estimations can result in factors that do not reproduce the correlation matrix as well as other methods - a situation indicated by high correlations in the residual correlation matrix [91]. However, despite the different approaches to factor extraction, PCA and PFA often produce highly similar solutions [91].

From correlation matrices involving a large number of variables, as would be the case constructing a number of tests, it is normal that a large number of factors will emerge, each only explaining a small amount of the overall variance. As the aim is to reduce and summarize the variance to a few, interpretable factors, decisions have to be made by the test developer as to how many factors to extract. Factors can be selected on the basis that they have Eigen values of one or more, by visual inspection of a Scree Test or on the basis of the expected number of dimensions [78, 91]. For example, as the item pool had been written specifically to capture the benefits and barriers associated with medication and dietary compliance, Bennett *et al.* requested a two factor solution for each of their scales [92]. Alternatively, the number of factors can be determined by inspection of the residual correlation matrices of several, repeated PCA or PFA, each requesting a different number of factors to be extracted [91]. If the number of factors extracted adequately summarises the data, there will be very little difference between the original correlation matrix and the correlation matrix reproduced by the factor solution. Tabachnick and Fidell, rather vaguely, suggest that 'several' residuals between 0.05 and 0.10 or a 'few' residuals exceeding 0.1 could indicate an inadequate factor solution [91].

2.4.3.2.3 Rotation

Even if the factors extracted explain an adequate proportion of the variance, rotation to simple structure is often required before they can be meaningfully interpreted [78]. However, although rotation alters the factor loadings so that each factor has only a few high loadings, thereby improving its interpretability, it does not improve the amount of variance the factor solution explains [78]. There are two forms of rotations available; orthogonal rotation where the factors are rotated in such a way that they remain uncorrelated and oblique rotation where factors may be correlated. There are many methods for achieving both orthogonal and oblique rotation, although most commonly used are Varimax and Direct Oblimin, respectively [78]. Kline suggests that oblique rotation is the technique of choice unless there is a compelling reason for assuming that the extracted factors are uncorrelated [78].

2.4.3.2.4 Factor Interpretation

Items are selected from the pool on the basis that they load (correlate) significantly, in excess of 0.3, and exclusively on one factor [78]. Kline also suggests that the selected items' p-values are inspected. An item's p-value represents the proportion of the sample getting the item correct or putting the keyed response. If the majority of participants are responding in the same way to a particular item it will not be able to reveal subtle differences between individuals. Once the items have been selected, the test constructor must then interpret what this empirically derived set of correlated variables is actually measuring [91]. This is obviously a subjective process and ideally should be followed by empirical testing as outlined in Section 2.4.5.

2.4.3.2.5 Replication

To ensure that the factor structure produced by the pilot study is stable and not a chance anomaly, Kline recommends that the factor structure should be investigated in a second pilot study [78]. While individual items are unlikely to load exactly as before, the general structure should be replicated.

2.4.3.2.6 Reliability

As discussed in Section 2.4.1, it is important to ensure that the scale is reliable, which can be achieved by assessing the inter-relatedness, or internal consistency, of the scale, as items are more likely to correlate highly with each other if they have low error components, i.e. they are relatively accurate measures of the true score.

Cronbach's alpha coefficient is considered to be the best index of internal consistency [78]. It is based upon an older concept – the split-half reliability which is calculated from when the scale, administered at one time point, is split into two and the scores on each half of the scale are correlated. The correlation produced from this procedure needs to be adjusted using the Spearman-Brown formula to take into account that the calculation is performed on only half the items in the full test [77]. However, there is no guarantee that any other single split will produce equivalent halves. Cronbach's coefficient alpha has been described as the mean of all possible split-half coefficients, corrected by the Spearman-Brown formula [77].

The reliability of the scale can also be assessed directly by administering the scale to a large ($n > 100$), heterogeneous and representative sample on two separate occasions and correlating the two sets of scores. The scale is considered reliable if the level of agreement between the two measurements exceeds a given threshold. While temporal stability is an appropriate criterion for scales assessing stable traits such as personality, it is less appropriately applied to tests of less stable constructs, such as knowledge and beliefs, which may genuinely change between tests following exposure to, for example, a relevant health education campaign. In such cases, low test-retest reliability does not necessarily mean that the scale is unreliable and is therefore difficult to interpret. It is suggested that the test and retest measurements are taken 3 months apart, as while a shorter span between tests would reduce the chance of intervening factors affecting an unstable construct, anything less than 3 months may result in the scores being influenced by recall and so artificially boost the test-retest reliability coefficient [78]. In addition, respondents who agree to repeat the test are likely to be highly motivated and, therefore, may not represent a 'heterogeneous and representative' sample with which to compare scores.

As Gregory points out, it is the amount of acceptable measurement error which influences the cut-off for the test-retest or internal consistency reliability coefficient. If important decisions are to be made about individual scores (e.g. treatment options), acceptable reliability coefficients may be as set high as 0.95 i.e. 95% of the measured variance is due to the dimension of interest [77]. Others suggest that 0.7 is the minimum reliability acceptable for a good test [78] while others, such as Bowling, suggest that 0.5 can represent a useful cut-off [90].

2.4.3.3 Factors Influencing Factor Analysis

2.4.3.3.1 Variables Entered

As Kline points out, rotation procedures minimise the variance explained by the first general factor, so that it is unwise to conduct factor analysis on an item pool that contains only one content domain [78]. However, the number of content domains developed at any one time must be balanced by the obvious limitation of how many variables measured by questionnaire items a participant can be reasonably expected to respond to.

2.4.3.3.2 Sample

Kline suggests that ideally a ratio of 3 subjects per item should be used in a factor analysis, although 100 represents the absolute minimum sample size [78]. Tabachnick and Fidell, on the other hand, suggest that 300 or more individuals represents a generally reliable sample size [91], while Comrey describes a sample size of 200 as fair [93].

In addition to being an adequate size, the sample also needs to be representative of the population for which the scale is intended and sufficiently diverse as to allow factors to emerge from the data. Although a representative, heterogeneous sample is desirable, sample characteristics such as gender can influence the factor structure. Kline recommends that the factor analytic method of test construction is carried out in parallel on male and female samples to ensure that the items are unidimensional for both sexes [78]. However, as Tabachnich and Fidell point out, a wide range of possible sample characteristics may produce separate factor structures [91], which, if accommodated, would dramatically increase the number of respondents required.

2.4.3.3.3 Data Screening

Prior to a factor analysis, Tabachnich and Fidell recommend that the data-set is screened for missing values and the variables examined for fit with the assumptions of multivariate analysis: multivariate normality, linearity, homoscedasticity, factorability, but the absence of multicollinarity and singularity, and the absence of univariate and multivariate outliers among cases [91]. Failure to address these issues can be extremely important. For example, both univariate and multivariate outliers can have a disproportional and, therefore, distorting influence on factor solutions. Others, such as multivariate normality, linearity and homoscedasticity are not essential, but can enhance the factor solution.

2.4.4 THE ITEM ANALYTICAL METHOD OF TEST CONSTRUCTION

2.4.4.1 Introduction

The factor analytical method of test construction, when properly applied, can produce reliable, discriminatory and unidimensional scales. It is not, however, particularly suitable for the construction of a single test as rotation tends to reduce the variance of the first factor extracted, and requires large resources [78]. An alternative method is the item analytic method of test construction which produces discriminatory and homogeneous scales and requires smaller sample sizes; a strategy employed by Butler *et al.* during their development of a psychological adjustment to morbid obesity scale [94]. Although the item analytical method does not assess unidimensionality, it is considered to be a viable alternative to factor analysis when the construct in question is clearly defined, making it possible to write unifactorial items [78].

2.4.4.2 Procedures

2.4.4.2.1 P-values & Item-Total Correlations

One method of item analysis described by Kline selects items on the basis of two criteria; a p-value between 0.2 and 0.8, as discussed in Section 2.4.3.2.4, and an item-total correlation exceeding 0.3 [78]. The correlation of each item with the total score is used to select suitable items, as this will ensure that the final scale is homogeneous. A corrected item-correlation coefficient can also be used which correlates each item with the sum of all other items [78]. This approach, although using different cut-offs, was used by Parmenter and Wardle in their development of a general nutrition knowledge questionnaire [95]. However, what is particularly interesting about their application is that items were retained if they failed the stated criteria on the basis that "...they were considered to be testing an essential aspect of nutrition knowledge not covered elsewhere in the questionnaire" (p300, [95]).

2.4.4.2.2 Maximization of Internal Consistency

The second approach to the item selection process described by Kline involves systematically removing items in order to maximise the remaining item's Cronbach's alpha coefficient [78]. In addition to computing an item pool's overall alpha, statistical packages such as SPSS will also calculate, for each item, the alpha for the item pool if it was removed. Items can, therefore, be systematically removed from the pool until the point is reached were the scale's internal consistency would no longer be improved by removing any of the remaining items and/or an acceptable coefficient is produced.

2.4.4.2.3 Replication

As with factor analysis, once item selection has occurred, it is recommended that the selected items should be administered to a new sample in order to check that the psychometric properties are stable and not the result of chance [78].

2.4.5 TEST VALIDATION PROCEDURES

2.4.5.1 The Concept of Validity

Oppenheim describes validity as "...the degree to which an instrument measures what it is supposed or intended to measure" (p160, [54]) – an undeniably important characteristic. Although there are several methods that can be used to establish a scale's validity, as previously discussed in Section 2.2, the constructs measured by psychological scales, for example outcome expectancies, are abstractions and so proving what the instrument measures can be challenging. Gregory also questions the static approach to the establishment of validity by suggesting the validation process is in fact ongoing, with evidence accumulating as the test is used in different populations over time [77].

2.4.5.2 Face Validity & Content Validity

Perhaps the least persuasive form of validity is face validity, which Oppenheim refers to as the extent to which the test developer believes that the items are useful [54]. However, face validity appears to be somewhat redundant as it would be an unlikely situation that saw a test constructor bothering to develop and/or use items s/he did not believe in. Gregory, however, extends this definition to include respondents and considers face validity to be an issue of general acceptability [77]. There is, however, very little guidance as to how this should be established, although most researchers appear to use feedback from pilot study participants (e.g. [94]). A more impartial, although still subjective version of face validity, is content validity. This represents the extent to which a panel of experts believe that the items included represent a well-balanced sample of the content domain to be measured [54]. For example, Parmenter and Wardle subjected their general nutrition questionnaire item pool to two reviews involving four psychologists and four dieticians [95]. In order to make these judgements, Kline suggests that content validity should only be applied to scales in which the domains are clearly defined [78]. However, once again, there is very little guidance available regarding appropriate sample sizes, the panel's qualifications, or how to deal with responses. Although Gregory does offer one approach to quantifying content validity based upon inter-rater agreement, he does not offer acceptable cut-offs and recognises that it fails to take into account more qualitative aspects [77]. Bennett *et al.* for example utilised a content validity index defined as the proportion of items rated as quite or very relevant by two experts, in their development of a scale to assess beliefs about medication and dietary compliance in people with heart failure, and considered the resultant value of 0.81 as acceptable [92].

2.4.5.3 Criterion Validity & Construct Validity

In addition to the subjective evaluations offered by content and face validity, there are empirical methods which aim to establish whether or not a scale is measuring what it is intending to measure. Criterion validity is said to be established if the scores from the proposed scale correlate significantly with some other measure of the construct in question [77]. There are two main forms of criterion validity. Firstly, concurrent validity which involves the simultaneous measurement of the construct in question using an established method and the proposed test, and secondly predictive validity, which assesses the ability of the test to predict future changes in relevant variables [77]. In addition to the use of criterion variables, validity can also be established empirically if the test correlates significantly with a set of theoretical sound assumptions about the cognition in question [54]. Construct validity can be further divided into convergent validity and discriminant validity on the basis of whether the expected correlation between the test and the other variable(s) is positive or non-significant/negative, respectively [77]. There is, however, some overlap between concurrent and construct validity; while concurrent validity involves the test's correlation with an established, valid measure of the construct in question, construct validity deals with theoretical assumptions. However, as discussed in Section 2.2, cognitions such as outcome expectancies are abstractions and so the extent to which an adequate criterion truly exists is questionable. As Kline points out, "When [good criterion tests] do not [exist,] concurrent validity studies are best regarded as aspects of construct validity" (p21, [78]). One such example, is the 12-item Short-Form Health Survey (SF-12), a generic measure of health-related quality of life (HRQL), which has been reported repeatedly to correlate highly with other measures of HRQL [96]. Whilst many of these other measures, such as the Nottingham Health Profile, are well-used, due to the abstract concept of HRQL, they cannot be considered entirely valid. The authors, therefore, discuss these results in terms of construct validity [96]. Suitable criteria/constructs with which to compare new scales can, however, be difficult to locate as very often the motivation for developing a new test is that no 'gold-standard' or sound theoretical assumptions have previously been established.

There can also be problems with predictive validity, as this relies upon the strength of the theoretical assumptions underlying prediction. For example, a study designed to investigate the predictive validity of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) with respect to outcome from Roux-en-Y gastric bypass (RYGBP) surgery for morbid obesity, demonstrated that several subscales did indeed predict one-year post-surgery weight loss [97]. It is, however, unclear as to how subscales which did not predict weight loss should be treated; can it really be claimed that do they not measure what they claim to measure or is it more reasonable to suggest that the construct in question does not predict post-surgical outcome?

2.4.5.4 Cross Validation

As discussed in Section 2.4.3.2.5 and 2.4.4.2.3, it is important to ensure that validity is not the product of chance by using a data-set that has not been involved in the item selection process [77].

2.5 CHAPTER TWO SUMMARY

Outcome expectancies (beliefs regarding the likelihood that an outcome will occur following an action and beliefs regarding the value of that outcome) and the cost-benefit analysis described by Expectancy Value (EV) Theory [56] and Subjective Expected Utility (SEU) Theory [57] (the relative balance of positive and negative outcome expectancies associated with a behaviour and its alternative(s)), are thought to play a central role in the pre-decisional, motivational phase of self-regulation and, therefore, determine behaviour such as that which influences bodyweight.

Psychometric scales offer a standardised and cost-effective method of quantifying psychological characteristics such as outcome expectancy cognitions. However, if meaningful results are to be produced, it is extremely important that attention is paid to scale's psychometric properties. Particular care needs to be taken to write appropriately worded items. These items must also have a suitable response format. For example, true/false/uncertain is a reliable and user-friendly method of assessing knowledge, while the Likert scale is a widely used method of assessing beliefs and attitudes. In terms of statistical test construction procedures, factor analysis can produce reliable, discriminatory and unidimensional scales, although the item analytic method is considered a viable and less demanding alternative. It is also important to establish that the scale measures what it claims to measure - a significant challenge for abstract concepts such as outcome expectancies.

CHAPTER THREE: OBESITY OUTCOME EXPECTANCIES

3.1 CHAPTER THREE INTRODUCTION

As discussed in Chapter Two, outcome expectancies have been implicated as key determinants of health behaviour. This chapter aims to describe why obesity can be considered a health behaviour and critically appraise existing research that has investigated obesity outcome expectancies. It also aims to describe the way in which outcome expectancies are currently utilized in obesity interventions and discuss their future potential, drawing upon lessons from the smoking literature. Finally this chapter aims to clarify the need for psychometrically sound measures of obesity outcome expectancies.

3.2 OBESITY AS A HEALTH BEHAVIOUR

While there are many different definitions in use, the term 'health behaviour' can be used to describe any specific action which, when carried out, is known to enhance or maintain health [62]. If health is defined as '...a complete state of physical, mental, and social well-being and not merely the absence of disease or infirmity' [21], it is clear that this concept embraces a huge variety of specific activities. A health behaviour can be considered as health-enhancing (e.g. exercise participation) or health-protective (e.g. vaccination against disease), it can represent the avoidance of a health-compromising behaviour (e.g. smoking) or it can be a sick-role behaviour which is undertaken in order to get well (e.g. compliance with medical regimens) [55].

In order to achieve a Body Mass Index within the healthy range of 18.5 – 24.9 kg/m^2, individuals need to undertake one of three processes - weight gain, weight maintenance or weight loss. While people classified as underweight need to undertake specific actions that promote a positive energy balance, people that are overweight need to adopt behaviours that promote a negative energy balance. In contrast, individuals who are already classified as a healthy weight need to continue current behaviour and/or adopt new behaviours in order to promote energy balance. Regardless of which process a person is undertaking to achieve a healthy body weight, the specific actions involved can all be broadly classified as weight control; a universally health-enhancing behaviour. However, as the focus of this enquiry is excess adiposity, the type of weight control referred to in this thesis can be defined as weight control to avoid obesity, be that weight loss or weight maintenance.

Although some behaviour, such as smoking tobacco, is directly health-compromising, the categorisation of other behaviours is dependent upon the context in which they are performed. Behaviour such as eating a portion of high-fat food, for example, is only health-compromising in the context of the consumption of an overall high-fat diet as, in the case of a diet which is generally extremely low in fat, the same action could actually be considered health-promoting. For obesity, the context in which a specific action is undertaken is also extremely important; as discussed in Section 1.4, it is the relative balance of a huge variety of possible specific actions relating to energy intake and energy expenditure that influences adiposity. Therefore, although successful or unsuccessful weight control, as indicated by adiposity, is strictly speaking an outcome rather than a behaviour [53], until more research is conducted into the behavioural determinants of obesity, it is very difficult to infer positive or negative weight control behaviour from specific actions or even categories of specific actions. If adiposity is used as the indicator of weight control behaviour, it is important to recognise that a significant proportion of an individual's body weight is likely to be due to non-psychological determinants, as discussed in Section 1.4. However, the extent to which cognitions predict behaviour will be enhanced if cognitions are salient and are measured with the same level of specificity or generality as the behaviour [53].

3.3 OUTCOME EXPECTANCIES REGARDING OBESITY-RELATED SPECIFIC ACTIONS

To date, a large amount of research that has investigated the role of Social Cognition Models (SCM) and outcome expectancies in relation to obesity, has focused upon cognitions regarding specific actions. In a review of health behaviour models in obesity prevention, Baranowski *et al.* provide numerous examples of studies that have investigated specific eating or physical activity behaviours associated with obesity, for example eating a high-fat diet, with cognition regarding those specific behaviours [68]. Kristal *et al.*'s analysis of the Washington State Cancer Risk Behavior Survey, for example, revealed that participants who reported fewer perceived barriers to eating a low-fat diet were significantly more likely to consume a low-fat diet after two years, even when adjusted for baseline and sociodemographic characteristics [98]. Similarly, Harnack *et al.*'s analysis of the 1992 National Health Interview Survey Cancer Epidemiology Supplement revealed that perceived barriers to eating a healthful diet, such as cost, showed a number of significant associations with higher fat intakes and lower fibre, fruit and vegetable intakes [99]. In a recent review of the role of outcome expectancies in predicting physical activity, Williams, Anderson and Winett concluded that the limited research to date has generated mixed results, although they do suggest that beliefs in the benefits of exercise are particularly predictive in older adults [100]. Of particular interest is a study conducted by Steptoe, Rink and Kerry which demonstrated that, following a brief behavioural counselling intervention, overweight sedentary patients with fewer perceived barriers to exercise at baseline, were more likely to increase their physical activity when followed up 12 months later [101].

While the cognitions and behaviours in these studies are measured with similar degrees of specificity, as previously discussed, adiposity results from the relative balance of a huge variety of possible specific actions relating to energy intake and energy expenditure. As Baranowski *et al.* conclude, although social cognition models such as the Theory of Planned Behaviour have great potential in obesity prevention, they recognise the need for outcome expectancies which deal with obesity, not just eating and physical activity behaviours [68].

3.4 OUTCOME EXPECTANCIES REGARDING OBESITY

3.4.1 INTRODUCTION TO THE OBESITY OUTCOME EXPECTANCIES LITERATURE

As outlined in Section 2.3, beliefs in the benefits of weight control behaviour and the costs of being obese (positive obesity outcome expectancies) and beliefs in the costs of weight control behaviour and the benefits of being obese (negative obesity outcome expectancies) are considered to predict weight control behaviour.

Although obesity outcome expectancies have also been investigated in an enormous variety of studies, this construct, along with many other cognitive variables, is often very poorly defined and operationalised. Furthermore, studies are also predominately descriptive in nature and utilise a wide variety of single item measures that are rarely used again. As discussed in Chapter Two, careful consideration of items is required to minimise measurement error and so this section aims to critically appraise the various ways in which previous studies have considered general health-related, specific health-related and psychosocial obesity outcome expectancies, with the key features of these studies presented in table-form in Appendix Two. It also aims to discuss how the research to-date has influenced what is understood about obesity outcome expectancies and finally to consider what further research is required.

In order to limit this review to a manageable size, several restrictions have been applied. Studies are excluded if items are explicitly concerned with childhood obesity on the basis that excess adiposity is not necessarily associated with the same outcomes in children and adults, for example employment prospects or sexual attractiveness. In addition, studies are excluded if they do not focus upon the outcomes associated with obesity but instead consider obesity as one of a range of risk factors for a particular health condition. Obesity has been considered in a huge number of studies regarding knowledge and beliefs regarding predominately cardiovascular disease risk factors (e.g. [102-104]), but also cancer (e.g. [105-107]) and even heartburn risk factors [108]. Unfortunately, these studies only employ a single item to assess the obesity-health condition relationship which is often then incorporated into risk factor scale, so that no information is presented about the individual item of interest.

One further limitation of this review is that studies will be excluded if they utilise personalised items, for example O'Connell and Velicer's 20-item Decision Balance Measure for Weight Loss [109]. This consists of two unidimensional subscales: a 10-item Pro Scale covering aspects of health, emotional well-being, and social approval (e.g. 'I would feel more optimistic if I lost weight') and a 10-item Con Scale (e.g. 'I would be less productive in other areas if I was trying to lose weight'). The authors found that among a sample of university students who considered themselves overweight, pros and cons were associated with weight loss stage of change as described in Section 2.2. However, a study by Krummel *et al.* that utilised O'Connell and Velicer's Decision Balance Measure for Weight Loss, demonstrated that, among 151 low-income women, although pros were significantly associated with stages for losing weight ($p < 0.001$), cons were not [110]. Hawkins, Hornsby and Schorling also demonstrated that, among a sample of 142 rural African American women, pros were significantly predictive of stages of change, although they did not measure cons [111]. However, pros have not always been shown to predict stage of change, for example Pinto *et al.* demonstrated that although overweight breast cancer survivors endorsed more pros than non-overweight participants, they demonstrated lower stages of motivational readiness for weight loss/maintenance [112].

Although these studies offer some support for the role of weight loss pros and cons in predicting stage of change for weight loss, these studies are cross-sectional and do not demonstrate that weight loss decisional balance predicts actual weight loss behaviour. This is particularly concerning as Jeffery, French and Rothman have demonstrated that stage of change did not significantly predict weight control over a 3 year period in their sample of 719 women [113]. Macqueen, Brynes and Frost have also reported that stage of change failed to distinguish dietetic outpatients most likely to lose weight [114], although Prochaska and colleagues have reported that participants in the action stage are more likely to attend treatment session and to lose more weight [115]. In terms of intervention studies, Logue *et al.* have reported that there have been mixed results from a number of randomized trials of Transtheoretical Model interventions that focused on a range of weight loss-related behaviours, although predominately physical activity [116]. These mixed results may be due to methodological problems such as poor operationalisation of key constructs such as decisional balance but the role of weight loss pros and cons in determining weight loss behaviour is far from clear.

Future research into the role of outcome expectancies in weight control could, therefore, be directed at determining whether scales such as O'Connell and Velicer's Decision Balance Measure for Weight Loss predict weight loss behaviour and not just stage of change categorisation. Arguably though, such research would be limited by its personalised nature and focus on weight loss. For obese participants, endorsement of personalised items such as 'My health would improve if I lost weight' requires two elements; a recognition that weight loss in those with excess adiposity would improve health, but also that the individual identifies themselves as having excess adiposity. An item that measures two constructs is likely to be unreliable.

In addition, although a slim individual may, and hopefully would, disagree with O'Connell and Velicer's item 'My health would improve if I lost weight', this does not provide any information about his/her beliefs in the role that overweight and obesity plays in determining health and whether these beliefs predict the maintenance of their healthy weight. Depersonalising the item to something like 'An obese person's health would improve if s/he lost weight', allows the standardised measures to be used to compare across a large number of study populations. For example, not only could a depersonalised item be used with individuals of different bodyweights but also by health professionals. Doctors, nurses, and dieticians all potentially represent important agents for obesity-related behavioural change either directly through the provision of motivation for patients or indirectly through the allocation of resources. Health professionals' involvement in promoting appropriate weight control behaviour, however, depends upon *their* outcome expectancies. As Kristeller and Hoerr suggest, recognition of the consequences of obesity and willingness to engage in weight control interventions, along with adequate skills and resources, are necessary for physician intervention [117].

3.4.2 HEALTH-RELATED OBESITY OUTCOME EXPECTANCIES

3.4.2.1 General Health-Related Obesity Outcome Expectancy Beliefs

Research into obesity outcome expectancies to-date has primarily focused upon cognitions regarding the health consequences of excess adiposity, which perhaps reflects the relative lack of consensus regarding the non-health effects as discussed in Section 1.2. A large proportion of this health-related research has considered the relationship between adiposity and health in very general terms. For example, in a survey of Australian dieticians conducted by Campbell and Crawford, 88% of participants agreed with the statement that *'Obesity is a major cause of morbidity and mortality'* [118]. This item was adapted for a subsequent survey published by Barr *et al.* in which 89.8% of the Canadian dieticians that participated agreed with the statement *'Obesity is a major contributor to morbidity & mortality'* [119]. A similar statement was used in a survey of US primary care physicians conducted by Foster *et al.* in which 91.4% of participants agreed with the statement *'Obesity is associated with serious medical conditions'* [120] and in a survey of US exercise professionals published by Hare *et al.* in which 83% of participants strongly agreed with the statement *'Obese persons have more medical problems than non-obese persons'* [121].

Although these studies reported data in similar response formats, difficulties arise when comparing these results. For example, although Canadian dieticians appear to be more likely than Australian dieticians to agree that obesity has a negative impact on health, these interpretations are seriously confounded by lack of information regarding when the data collections took place. As the authors cited the study by Campbell and Crawford as informing their questionnaire development, it is likely that the surveys in the study by Barr *et al.* were administered after 1997. This time lag, however, may represent an important confounding factor as awareness of obesity is likely to change over time. It is also important to recognise that, although the responses are all interpreted as beliefs that obesity has a negative impact on health, and that the statements, particularly those used by Campbell and Crawford and Barr *et al.*, are similar, none of the statements are identical and so the extent to which they are assessing the same construct can be called into question.

As part of an extensive needs assessment of health professionals involved in the care of children and adolescents with obesity in the United States, Story *et al.* found that paediatric nurse practitioners were significantly more likely to agree with the statement *'Overweight affects chronic disease risk'* compared with paediatricians, who were significantly more likely to agree than registered dieticians [122]. Considering dieticians' nutrition-related expertise, it is perhaps surprising that they do not demonstrate more agreement. However, although the item does not specify whether the participant should respond in reference to childhood obesity, this is the focus of the majority of items in the survey. This item, therefore, has the potential to be interpreted in different ways, and if participants have different opinions regarding the impact of obesity in children and adults, this has the potential to introduce measurement error. It is also interesting to observe that the covering letter which accompanied the initial mailed survey emphasized "...the importance of the issue of child and adolescent obesity..." (p206, [123]), presumably to improve the study's response rate. Unfortunately, no further details are available regarding precisely what information was provided, although it is likely that the authors discussed the prevalence of obesity and/or the severity of its consequences. Any discussion as to the obesity's impact in the covering letter would also have the potential to prime respondents to statements such as *'Overweight affects chronic disease risk'*.

As an alternative to the popular Likert scale response format, Kristeller and Hoerr employed a ranking system in order to investigate perceptions of US physicians across six medical specialities towards the management of obesity [124]. Although the exact wording has not been published, respondents were invited to rank three levels of obesity ('morbid', 'moderate', 'mild') in comparison to six other health risk factors, in importance to the "*...maintenance of an individual's general health and the avoidance of future medical problems*" (p544,

[124]). While it can be concluded that, for example morbid obesity is considered to be more important than excess alcohol, this ranking method does not provide any evidence regarding the absolute level of importance placed upon each risk factor. Despite this, the authors interpret these results as indicating that "...physicians appear to recognise the medical significance of moderate and morbid but not mild obesity..." (p548, [124]).

In addition to this ranking system, Kristeller and Hoerr also asked participants to rate two items using a 7-point Likert scale; '*I think it is important to treat obesity before it has a chance to cause medically related problems*' and '*Being obese is not a serious problem unless it causes or aggrevates a patient's medical condition*' [124]. These items do not, however, assess the absolute *risk* associated with obesity.

Rather than directly assessing beliefs regarding obesity's negative impact on health, several studies have employed items that assess the importance of not being obese for health. For example, the survey of French general practitioners conducted by Bocquier *et al.* revealed that the overwhelming majority of participants (99.2%) indicated that, on a 4-point Likert Scale, they either 'strongly agreed' or 'rather agreed' with the statement '*Normal weight is important for health*' [125]. Similarly, in the survey conducted by Hare *et al.*, 71% of participants - US fitness professionals – endorsed 'very important' in response to the item '*How important do you believe normal weight is to the health of a person?*' [121]. Although it may be tempting to suggest that French general practitioners believe normal weight to be more important than US fitness professionals, in addition to the potential for data collection to have occurred in different years and the differences in item wording, such comparisons would be confounded by the use of different response formats. The extent to which a response of 'strongly agree' or 'rather agree' out of four potential options is equivalent to a response of 1 (very important) or 2 out of seven potential options is unknown.

In an older study, Price *et al.* reported that 94% of the US family physicians who participated in their survey believed that "...normal weight is important for patients" (p342, [126]). Unfortunately, in addition to the fact that there is a lack of detail as to exact item wording and the response format, the authors do not specify that normal weight's importance should be judged in terms of health, resulting in a much less specific item. This lack of specificity is also evident in an item employed by Power, Holzman and Schulkin, in a survey of US obstetrician-gynecologists in which 85.0% agreed to the statement '*Obesity is major concern for my nonpregnant patients*' [127]. Another example is the European Health and Behaviour Study (EHBS) in which ratings were obtained for beliefs in the importance of a range of health behaviours including '*keep bodyweight within normal limits*', using a 10-point response format [128]. Although the EHBS collected data on behaviours and attitudes relating to health from around 16,500 university students on non-health related courses in 21 countries European countries [129], the responses to this item have only been published for the sub-sample of 656 French students [128]. The authors demonstrate that females rated '*keep bodyweight within normal limits*' as significantly more important than males, although it is notable that, on average, both sexes considered it to have some importance. This item is, however, confounded by the fact that, although this range of behaviours are described as health measures, the questionnaire does not explicitly ask participants to respond with reference to health only. This potentially adds measurement error as participants may or may not have taken into account the range of physical, psychological, functional and social consequences that have been associated with bodyweight, as discussed in Section 1.2. It is possible that gender differences exist regarding the outcomes which are considered important, and these may account for the significant differences in scores between males and females.

It is also worth mentioning that, in an attempt to assess the importance, health or otherwise, of not being obese, these studies have opted for the term *normal* weight. Although in the internationally recognised World Health Organization Body Mass Index classification 18.5 to 24.9 kg/m^2 is classified as the 'normal range' [5], this terminology has the potential to introduce error. As previously discussed, data from 2002 suggests that in the UK, 70% of men and 63% of women are either overweight or obese [33] and so excess adiposity is, therefore, more frequently occurring than BMI $<$ 25 kg/m^2. Normal weight might also be interpreted as the body's 'natural' state which may or may not be considered to fall within the recommended 18.5 – 24.9 kg/m^2 range.

Power, Holzman and Schulkin avoided this issue by asking their participants - US obstetrician-gynecologists - to respond to the question '*How important to the health of your patients do you consider weight to be*?' [130]. Out of the four possible response options (very important, important, not important or no opinion), 49.1% of respondents selected very important [127, 130]. At first glance, this figure appears to be markedly lower than that obtained by Bocquier *et al.*'s French general practitioners and Hare *et al.*'s US fitness professionals, although there are several important methodological factors that might account for this. As discussed, there is no reliable way of comparing results obtained from different items and response formats. In addition, by not specifying the amount or range of weight that the respondent must consider, this item requires the respondent to judge the full spectrum of potential bodyweights, and it is possible that a respondent might consider excess adiposity to be less important than underweight. The other way in which this item significantly differs from those employed by Bocquier *et al.* and Hare *et al.* is that the participant is required to make the judgement in relation to their own patients. It is conceivable that a participant may indicate that weight is not important as none of their patients are under- or over-weight, even though they believe under- or over-weight would be important for a patient's health. This raises a critical feature of items that assess the importance of weight for health. The importance of a risk factor may not only be judged by the magnitude of risk conferred, but also by the frequency by which it occurs; for example, whilst a bite from a snake such as the Black Mamba is extremely likely to result in death, it may not be considered an important cause of death as relatively few bites occur. A similar comment can also be made about the item *'Obesity is a major health problem in the United States'* employed by Power, Holzman and Schulkin. Here an individual may endorse the item because they believe that obesity results in serious health problems and/or because they believe that obesity is very prevalent in the United States.

Rather than assess the 'importance' of obesity, Hoppe and Ogden assess the 'seriousness' of obesity. If this item is worded so that the respondent considers the health of an individual this would avoid the problem of potentially assessing both severity and frequency. However, unfortunately the authors do not report the exact item wording or response format.

The relationship between obesity and health has, however, been assessed much more directly. For example, as part of the Attitudes Toward Obese Persons Scale (ATOP), Allison, Basile and Yucker developed the statement *'Obese people are just as healthy as nonobese people'* to which participants responded using a 6-point Likert Scale (+3 = I strongly agree, +2 = I moderately agree, +1 = I slightly agree, -1 = I slightly disagree, -2 = I moderately disagree, -3 = I strongly disagree) [131, 132]. Although the ATOP is designed to be used as a structured scale, several studies have reported data relating to this single item. For example, in a survey conducted by Neumark-Sztainer, Story and Harris, 59.1% of the teachers and school health care providers working with adolescents who participated either strongly disagreed or disagreed [133]. The original item was, however, adapted by Harvey and Hill so that their participants - UK general practitioners and clinical psychologists - either responded to '*Moderately overweight people are as healthy as normal weight*' or '*Extremely overweight people are as healthy as normal weight people*' [134, 135]. Although the authors retained a 6-point Likert Scale, responses this time were scored as 1 = strongly disagree to 6 = strongly agree. The mean score for the 'moderately overweight' item was 2.55 and 1.62 for the 'extremely overweight' item. Unfortunately, although these studies employed similarly labelled response formats, the differences in scoring, along with the use of different bodyweight descriptors, inhibits meaningful comparisons.

It is interesting to observe that while Harvey and Hill opted to ask respondents to make their judgement with reference to 'normal weight people', presumably because 'not extremely overweight people' would unacceptably increase the item's complexity, the original item employed the term nonobese. Although this avoids the issues regarding the term 'normal', nonobese is less specific and encompasses anything from underweight to overweight and, therefore, has the potential to be interpreted in more that one way. Despite these criticisms regarding the terminology used, these items have two notable features. The results from the survey conducted by Harvey and Hill suggest that the item may have construct validity, as participants were more likely to endorse 'extremely overweight' than 'moderately overweight'. However, it is important to recognise that these results were obtained on two samples of participants. The other notable feature is that, unlike the majority of other items, these items require a negative response to indicate a positive belief regarding the negative impact of excess adiposity on health, therefore reducing the potential for acquiescent response bias as discussed in Section 2.4.2.1.5.

Three other studies have also employed items that require a negative response to endorse the health risks of obesity. While 85.9% and 91.7% of the US obstetrician-gynecologists surveyed by Power, Holzman and Schulkin selected 4 or 5 on a 5-point Likert Scale (1 = strongly agree and 5 = strongly disagree) to '*The health risks of obesity are overstated*' and 'The *health risks of obesity are unproven*', respectively [127], 84% of the UK dietetic patients with Body Mass

Indexes ≥ 30 kg/m^2 surveyed by Thompson and Thomas agreed with the statement '*Weight is blamed for most medical problems*' [136]. These results could suggest that, while medical professionals are ready to accept the link between obesity and poor health, this sample of patients for whom bodyweight represents a significant health risk do not. However, although the use of 'blame' implies that weight is unfairly associated with health risks, it is feasible that a participant could respond positively to the item employed by Thompson and Thomas if they believed that weight was appropriately blamed for most medical problems.

Stern *et al.* also employed a negatively worded item; '*It is perfectly O.K. to gain weight as you get older*' to which participants responded using a 5-point Likert scale (strongly agree = 5 to strongly disagree = 1) with results being reported as age- and weight-adjusted means of the percentage of the maximum score out of 5 [137]. The participants, Mexican American and US Anglo adults, scored 40 - 48% [137] while in a subsequent study conducted by Harris and Koehler involving US Anglos and Hispanics, the same item produced scores of 36 - 40% [138]. Although Harris and Koehler did not demonstrate any significant gender or ethnicity effects on scores, Stern *et al.* demonstrated that the sample of Mexican-American men in transition neighbourhoods might benefit most from a health education initiative that aims to reduce the acceptability of weight gain. However, this item does not specify whether the weight gain in question should be judged in terms of health and, therefore, has the potential to be judged on a range of possible outcomes.

Despite the literature being dominated by research into education- or health-related professionals, studies in addition to those conducted by Thompson and Thomas, Stern *et al.* and Harris and Koehler have also surveyed non-health professionals regarding obesity's general health impact. Of particular interest is the 1999 Marketing and Opinion Research International (MORI) survey of attitudes towards obesity due to its large representative sample of UK participants [139]. Unfortunately, the exact item wording and response format have not been published, although the report does claims that "...9 in 10 adults agree that obesity is a serious health risk" (2nd paragraph, [139]). It is interesting to observe that the high ceiling effect of health professionals' positive beliefs in the negative impact of obesity on general health is reflected in this sample, which presumably has not had the same level of health-related education and training and could, therefore, be expected to be less aware. This could be taken to suggest that public health education campaigns to raise awareness of the impact of the obesity on health are not necessary in the UK.

Two further studies report that 87.6% of Saudi male adolescents aged 12 to 20 years responded 'correctly' to (presumably agreed with) the item 'Obesity is dangerous for health' [140] and 91% of 141 Israeli high-school students aged 14 to 18 years believed that obesity is a high risk factor for poor health [141]. Although not enough detail regarding the exact item wording, the response formats or the scoring systems used is provided to evaluate critically, these results do suggest that the high ceiling effect observed for both health professionals and the UK adult population is also evident in adolescents.

In addition to beliefs regarding the impact of different bodyweight states on health, several studies have assessed the perceived impact of weight loss on health. For example, in addition to asking participants to indicate their beliefs about the importance of *'keep[ing] bodyweight within normal limits'*, the European Health and Behaviour Survey asked participants to respond to *'lose weight'* on a 10-point response format [128]. As with *'keep bodyweight within normal limits'*, in the sample of French students, females considered *'lose weight'* as significantly more important than men. However, this item is not only confounded by the lack of reference to health and its bi-directionality, but also does not specify that the participant should judge the importance of losing weight for those that have excess adiposity. This is an important detail as weight loss in those who do not have excessive adiposity is not beneficial and could even represent a health risk.

Although the exact wording of the item is unpublished, participants in Hoppe and Ogden's survey of UK practice nurses were asked to 'rate the benefits of weight loss to health' on a 7-point Likert Scale, where 1 = not at all and 7 = extremely, and the resultant mean score ranged between 6.26 and 6.31 [142]. Without further details, particularly regarding the response format, these results are meaningless. However, unlike the 'weight loss' item included in the European Health and Behaviour Study, this item is focused upon health, although it does fail to specify whether the participant should respond with reference to situations of excess adiposity only.

This lack of specificity regarding the condition under which weight loss has a particular outcome is also a feature of an item developed by Campbell and

Crawford; *'Small weight losses can produce important medical benefits'* [118]. Ninety-two percent of the Australian dieticians surveyed indicated that they agreed with this statement, compared to 88% of participants in a subsequent survey of Australian general practitioners [143]. In this rare instance of an item being exactly replicated in two studies, it is possible to suggest that Australian dieticians are more likely to endorse the medical benefits of small weight losses than Australian general practitioners. However, caution must still be employed due to the fact that, although the authors report that the dietician survey was conducted in 1997 and the GP survey subsequently, the exact time gap is unknown and may, therefore, represent a significant confounding factor. Although confidence intervals would allow a judgement regarding statistical significance, these are not reported in this, or any other study discussed in this review. This item was also used, although slightly modified, by Barr *et al.* who reported that 96.8% of their participants - Canadian dieticians - agreed with the statement *'Small weight losses can produce important health benefits'* [119]. Once again, suggestions that Canadian dieticians are more likely to believe in the health benefits of weight loss than Australian dieticians should be treated with a certain amount of caution. However, it is clear that from all of these studies, that only a minority of health professionals do not believe in the relationship between weight loss and positive health outcomes.

Campbell and Crawford, however, have developed a more specific item *'Only people who are very overweight or obese will gain health benefits from reducing their weight'* [118] which was also subsequently modified by Barr *et al.* *'Only people who are very obese will gain health benefits from reducing their weight'* [119]. In the study by Campbell and Crawford, 12% of the Australian dieticians surveyed agreed, compared with 90.4% of Barr *et al.*'s Canadian dieticians who disagreed. Unfortunately, the results of these studies cannot be directly compared due to differences in the weight descriptors used and reporting of results. They are further confounded because a negative response to these items may be due to a belief that people who are not very overweight or obese (which theoretically encompasses everyone from underweight to overweight) would benefit from weight loss, *or* that very overweight or obese people would not benefit. Price *et al.* also appear to have investigated beliefs regarding the level of excess adiposity required to produce health effects, as they report that 52% of their participants - US family physicians - believed that "...increased health risk did not occur until patients were 20% above ideal weight" although no details are provided as to how this result was obtained [126].

Stern *et al.* also tried to specify for whom weight loss would have benefits in the item '*Nearly all Americans would be healthier if they lost some weight*', to which Mexican American and US Anglo men and women scored on average between 74 - 78% of the maximum score [137]. Despite the fact that this item is seriously confounded by the extent to which the respondents considered overweight to be prevalent in America, it was used in a subsequent study involving US Anglos and Hispanics [138]. In contrast, Bocquier *et al.* specifies both the bodyweight at which the respondent should judge the positive impact of weight loss and the context of health: '*For overweight and obese patients even small weight loss can produce health benefits*' [125]. In their sample of French general practitioners, 99.2% of participants indicated that, on a 4-point Likert Scale, they strongly or rather agreed with this statement. Although this item is more specific than the one developed by Campbell and Crawford and later modified by Barr *et al.*, these items all fail to quantify the amount of weight loss under discussion. Different judgements regarding 'small' have the potential to introduce measurement error. However, in their survey of US primary care physicians, Foster *et al.* asked participants to respond to an item which answered all of these criticisms by specifying the amount of weight loss and implying the 'base-line' weight; '*A 10% reduction in body weight is sufficient to significantly improve obesity-related health complications*' [120].

The survey conducted by Power, Holzman and Schulkin is, once again, notable for employing an item for which a negative response indicated a positive belief regarding the benefits of weight loss; '*Weight reduction efforts generally do not improve health*' to which 86.1% of the US obstetrician-gynecologists surveyed disagreed [127]. This item is, however, seriously confounded by the fact that agreement may also be due to a belief that weight reduction efforts do not improve health because they do not result in actual weight loss, thereby underestimating outcome expectancy beliefs.

Two further items employed in the same study by Power, Holzman and Schulkin are also worth mentioning; '*Outside of pregnancy, the benefits of weight loss for obese patients are greater than the risks*' and '*During pregnancy, the benefits of weight loss for obese patients are greater than the risks*'. While these items specify the conditions under which the weight-loss relationship should be judged, i.e. pregnancy status and obesity, these items do not define the benefits exclusively in terms of health. In addition, the participant is asked to compare benefits against risks, which does not provide any information regarding beliefs about the absolute level of benefits. However, in defence, it should be recognised that this criticism can only be levied at this item if it is reviewed in terms of outcome expectancies and not the relative balance between benefits and risks.

Also of interest are two items employed by Bocquier *et al.* [125] and Foster *et al.* [120]; *'Obesity is a disease'* and *'Obesity is a chronic disease'*, respectively. In both samples of general practitioners, the overwhelming majority of participants endorsed the concept of obesity as a disease. Although this endorsement could be interpreted as indicating that participants were aware of the near certainty of health effects associated with obesity, this should be treated with caution in light of the many and varied definitions of disease [11].

3.4.2.2 Specific Health-Related Obesity Outcome Expectancy Beliefs

It is clear from that, despite the numerous and diverse methodological difficulties, items assessing the general effect of obesity on health have, on the whole, displayed significant ceiling effects with the majority of participants endorsing obesity as a cause of poor health. As discussed in Section 2.4.3.2.4, if the majority of participants are responding in the same way to a particular item, it will not be able to reveal subtle differences between individuals. Rather than assess very general concepts, several studies have attempted to deal with the health consequences of obesity more specifically, by citing particular medical conditions.

Price *et al.*, for example, developed a series of five unstructured items assessing beliefs regarding health effects of obesity; *'coronary disease'*, *'osteoarthritis'*, *'diabetes mellitus'*, *'stress'*, and *'colon cancer'* [126]. The frequency of participants – US family physicians - who 'believed' in the role of obesity in the aetiology of each condition were 88%, 85%, 96%, 60%, 48%, respectively. Unfortunately, however, the authors do not report the exact wording of their items, although they do appear to be uni-directional, or the response format used, although there is some suggestion that it is a seven-point Likert scale.

Despite these problems, a subsequent survey of 214 US military family physicians conduced by Loomis *et al.* attempted to replicate this study [144]. It was reported that 86%, 78%, 92%, 87% and 35% of participants 'believed' in the role of obesity in the aetiology of *'coronary disease'*, *'osteoarthritis'*, *'diabetes mellitus'*, *'hypertension*, and *'colon cancer'*, respectively. These results were compared against those reported by Price *et al.* but the authors admit to having been hampered by the lack of detail regarding the exact items used [144]. Despite this, the authors too, do not report any detail regarding their exact items used or the response format. This lack of detail makes it difficult to assess whether the health impact of obesity, particularly in relation to colon cancer, is less likely to be endorsed over a period of time (approximately 14 years based upon the publication dates) when obesity awareness might have been expected to have increased. It is also interesting to observe that responses to 'stress' in the original study by Price *et al.* [126] were compared against responses to 'hypertension' in the subsequent study by Loomis *et al.* [144] although it is unclear as to the extent to which these represent the same condition.

In a survey of perceptions of childhood obesity among US school nurses, Price *et al.* altered their series of items by adding *'stroke'* and *'hypertension'* and specifying *'diabetes mellitus type II'* [145]. This modification is particularly important as responses to 'diabetes mellitus' may reflect beliefs regarding both type 1 and type 2 diabetes mellitus, thereby introducing measurement error. In addition, more information is provided regarding the items (*'What role does obesity play in the etiology of the following diseases?'*) and the response format (seven-point Likert scale) employed. Eighty-nine percent, 48%, 71%, 90%, 40%, 63% and 73% of US school nurses surveyed 'agreed' or 'strongly agreed' with the role of obesity in the aetiology of *'coronary disease'*, *'osteoarthritis'*, *'diabetes mellitus type II'*, *'hypertension*, *'colon cancer'*, *'stress'* and *stroke'* respectively. It is, however, unclear as to how a participant could express agreement with an item that is written as a question rather than a statement. Although it appears that US school nurses have less positive beliefs in the health impacts of obesity, with the exception of coronary heart disease, this interpretation is somewhat confounded by the lack of information regarding the response format and the year of data collection.

Price and colleagues went on to use six of these seven items once again in a survey of US paediatricians, although the extent to which they were replicated is difficult to determine due to the lack of detail reported [146]. In this study, more information, although not comprehensive detail, is provided regarding the items ("The pediatricians were asked if obesity played a major role in six different diseases." (p97, [146]) but not the response format. Seventy-three percent, 33%, 7%, 33%, 12%, and 50% of the participants strongly agreed with the major role of obesity in the aetiology of '*coronary disease*', '*osteoarthritis*', '*diabetes mellitus type II*', '*hypertension*, '*colon cancer*', '*stress*' and *stroke*' respectively. Despite the difficulties with comparing the results of these studies, it is interesting to observe that this sample of US paediatricians appear to be less likely to endorse the health impacts of obesity than their samples of US family physicians [126] and US school nurses [145], and Loomis *et al.*'s US military family physicians [144]. However, this observation may be explained by the fact that the role of obesity is described as 'major'. Although a participant may agree with the role of obesity in the aetiology of a certain medical condition, they may not agree that it has a major role. It is also worth noting that, as in the needs assessment conducted by Story *et al.* [122], the subject of the two surveys conducted by Price *et al.* [145, 146] were childhood obesity, and it is not clear whether the participants should be responding in terms of the impact of obesity on health in adults and/or children.

Power, Holzman and Schulkin also used a multiple answer style question, i.e. a question establishing the risk factor (obesity) and the relationship (causal) followed by a series of health conditions, with their sample of US obstetrician-gynecologists [127]. In this survey, participants were asked '*Please rate each of the following diseases or health concerns by your opinion as to whether obesity: 1 = increases the incidence, 2 = might increase the incidence, 3 = has no effect, 4 = might decrease the incidence, 5 = decreases the incidence, or 6 = you have no opinion*' followed by twenty health conditions [130]. The inclusion of some of health conditions which are not established obesity-related comorbidites, for example lung cancer and osteoporosis, marks this study apart from those conducted by Price and colleagues [126, 145, 146] and Loomis *et al.* [144], by potentially limiting acquiescent response bias. Unfortunately the authors do not report the proportion of respondents who believe that obesity increases or decreases the incidence of each of the twenty health conditions, merely the response used by the 'majority' of participants. The sample, however, does appear to be predominately endorsing obesity's role in the development of a wide range of obesity-related comorbidities. In addition, respondents were asked '*To what extent do you feel the following are possible risk factors for hypertension?*' and '*To what extent do you feel the following are possible risk factors for gestational diabetes?*' which were followed by eight or nine risk factors including obesity each with a four response categories (1 = major risk factor, 2 = minor risk factor, 3 = not a risk factor, 4 = don't know/no opinion) [130]. Obesity was considered to be a major risk factor for hypertension and gestational diabetes in 89.0% and 72.6% of respondents, respectively [127]. Although a proportion of US paediatricians surveyed by Price *et al.* [146] also responded in terms of obesity's major role, they did not consider this in terms of hypertension or gestational diabetes, thereby limiting comparisons that can be made.

In a survey of UK general practitioners and general practice patients, Ogden *et al.* invited participants to indicate the extent to which they believed *'diabetes'*, *'painful joints'*, *'heart disease'*, *'high blood pressure'* were medical consequences of obesity on a 5-point Likert Scale where 'not at all' = 1 and 'totally' = 5 [147]. Mean scores for each item ranged between 3 and 4 with only the *'diabetes'* item showing a statistically significant difference between the samples of general practitioners and general practice patients. Unfortunately, without further details regarding the items, it is difficult to conclude whether the general practice patients, who presumably have low levels of health-related expertise, are less likely to endorse the diabetes as a health consequence of obesity than general practitioners, perhaps indicating the need for a health education intervention, or whether the items were written in such a way that it was more likely to be endorsed by the general practitioners.

In addition to the three items dealing with health in general terms discussed previously, Barr *et al.* asked their participants - Canadian dieticians - to respond to one statement dealing with a specific health condition; *'An obese, fit adult has the same risk of heart disease as a lean, fit adult'*, using a 5-point Likert Scale collapsed to a 3-point scale (agree, neutral, disagree), to which 57.8% disagreed [119]. This is a particularly noteworthy item in that it specifies that the comparison between obese and lean individuals is independent of physical fitness, specifies that the individuals in question are adults, and avoids the use of 'normal' weight, opting instead for 'lean'. It is interesting to speculate whether the relatively low proportion of participants who disagreed with this item compared to the high proportion of participants who endorsed the role of obesity in the aetiology of 'coronary disease' items employed by Price and colleagues [126, 145, 146], Loomis *et al.* [144] and Power, Holzman and Schulkin [127], is due to the fact that the relationship is independent of physical fitness. However, this interpretation must be treated with caution, not only because of the other differences in wording and response formats used, but also because a negative response to the item employed by Barr *et al.* may indicate a belief that an obese, fit adult has a higher *or* lower risk of heart disease than a lean, fit adult.

Stern *et al.* also developed a single, specific cardiovascular-related item; '*People who weigh less have lower blood pressure'*, to which participants responded using a 5-point Likert scale (strongly agree = 5 to strongly disagree = 1) [137]. This study demonstrated that Mexican American and US Anglo adults scored between 60 and 69% of the maximum score of 5 [137], while a subsequent study by Harris and Koehler reported that US Anglos and Hispanics scored similarly between 61 and 69% [138]. Although this item demonstrated some ability to discriminate between individuals, it is limited by the fact that it does not specify a weight against which 'less' should be judged or quantify the weight difference.

Several studies have considered the impact of weight loss on health in general terms but only one study has assessed beliefs regarding the impact of weight loss on specific health conditions. Kristeller and Hoer asked their participants - US physicians across six medical specialities - to indicate "...how important weight loss was to [the] management of specific medical conditions" (p544, [124]). Although it is clear that respondents used a five-point Likert scale where a score of five indicated the highest level of importance, the range of scale is not explicitly stated. Five-point Likert scales typically range from positive through to negative, but it is not clear whether, on average, all the items were rated at some level of importance. However, it is clear that weight loss is considered more important for some comorbidities than others. For example, the comorbidity for which weight loss is considered most important is type II diabetes mellitus, which to some extent mirrors the high proportion of health professionals that have endorsed items implicating obesity in the condition's aetiology in the studies previously discussed. Although this item can be commended for using the concept of importance in a unidirectional manner, unlike previous studies, it does, however, fail to specify whether the participant should make their judgment in terms of those that have excess adiposity and, by assessing importance, does not exclusively assess the magnitude of association.

It is remarkable that whilst many studies have assessed beliefs regarding the impact of obesity on health, only three studies have employed structured scales of items. Hoppe and Ogden, however, created a two domain scale using the question "*...in comparison to patients of average weight, what is the likelihood* *that obese patients will suffer from the following health problems in the future..."* which was followed by 3 cardiovascular (*'coronary heart disease'*, *'stroke'*, *'hypertension'*) and 4 non-cardiovascular (*'diabetes'*, *'psychological problems'*, *'joint trauma'*, one unspecified) health conditions to which participants were asked to respond using a seven-point Likert scale (much below average = score of 1; much above average = score of 7) [142]. Among their sample of UK practice nurses, means for the cardiovascular comorbidity domain ranged between 5.84 to 6.04, while means for the non-cardiovascular comorbidity domain ranged between 5.04 and 5.44. Although it appears that participants were more likely to believe that obese people had a higher risk of cardiovascular than non-cardiovascular problems, no information is available as to whether this was statistically significant. In terms of psychometrics, each domain produced a Cronbach's Alpha Coefficient of 0.7 or above, indicating that they were internally consistent and, therefore, reliable. This is particularly impressive considering the small number of items, the diversity of the non-cardiovascular domain and the lack of specificity for conditions such as diabetes. In a previous study, Ogden produced an internally consistent general medical consequences of obesity belief scale for use with UK female slimming club members [148]. Although the response-format is not described, participants' rating of five items *pertaining to 'joint problems', 'heart disease', 'stomach cancer', 'bowel cancer' and 'diabetes'*, were summed to produce the scale score.

In a large survey of Taiwanese adults, Kan and Tsai asked 3700 participants to indicate *"...whether they think obesity will cause: 1) apoplexy, 2) hypertension, 3) diabetes, 4) heart disease, 5) gout, 6) breast cancer, 7) ulcer"* using a four-point scale: very likely = 3, possibly = 2, don't know = 1, not possible = 0 [149]. The authors then subjected the responses to factor analysis and discovered that, for both males and females, these items loaded heavily and exclusively on a single factor and, therefore, represented a single, unidimensional scale. Although factor scores were then used in subsequent analysis, this study does have several important limitations. Terms such as apoplexy are dated, while ulcer could refer to both stomach ulcers and ulcers of peripheral blood vessels, although it is possible that this detail was lost in translation. Another important limitation is the use of exclusively positively worded items which has the potential to introduce acquiescent response bias.

3.4.2.3 Health-Related Obesity Outcome Expectancy Knowledge

As there is a substantial amount of evidence supporting the role of obesity in the aetiology of a number of health conditions, it is possible to judge the endorsement of several health-related outcome expectancies in terms of knowledge. Although a large amount of research, including nationally representative surveys, have assessed beliefs regarding the health effects of obesity, relatively little has properly considered the accuracy of responses when judged against established facts. Although the majority of studies described in Section 3.4.2.2 avoid describing health-related outcome expectancy beliefs as knowledge, Power, Holzman and Schulkin [127], Stern *et al.* [137] and Kan and Tsai [149] all falsely claim to measure knowledge. These three studies all assess obesity outcome expectancies using scales rather than absolute, true/false style categories. As discussed in Section 2.2, knowledge cannot be judged in terms of the extent of its truth; it is either true or false. Other authors have correctly not claimed to be measuring knowledge, but have then gone on to inappropriately interpret their results as indicating levels of knowledge. For example, Kristeller and Hoerr employed a ranking item which, although does not exclusively assess the magnitude of an association, was interpreted as indicating that "...physicians appear to recognise the medical significance of moderate and morbid but not mild obesity..." (p548, [124]). Although Price *et al.* [146] discusses the 'appropriateness' of their participants' responses, obtained on a 7-point Likert Scale, against the evidence presented in the National Heart Lung & Blood Institute & National Institutes of Health's report 'Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report' [15], it is unclear why a score of 6 or 7 endorses these 'facts'. Particularly when a score of 5, which exceeds the neutral score of 4 and presumably also indicates endorsement of the relationship between obesity and the comorbidity, does not. Despite these examples of inappropriately used health-related outcome expectancy belief item responses, several studies have more appropriately considered health-related outcome expectancy knowledge.

As part of the 1998 Improving the Nutrition and Care of the Overweight Patient Survey, a sample of Scottish general practitioners, practice nurses and practising dieticians completed three items regarding the impact of obesity/overweight on hypertension, urinary incontinence and sleep disturbances, one of which was negatively worded [150]. Although the participants responded to the items using a three-point Likert scale (Disagree, Neutral, Agree) and the results are reported under the heading 'Beliefs about medical consequences of overweight and obesity', the responses to each item were judged to be correct or incorrect and, therefore, treated as aspects of knowledge. Statistically significant differences in the responses between health professionals were found for three items, with general practitioners consistently more likely to give the most correct answers. In general, practice nurses appeared to be as well informed as dieticians. Although this is perhaps surprising considering dieticians' nutrition-related expertise, it does accord to some extent with Story *et al.*'s findings regarding beliefs about the impact of overweight on chronic disease risk [122]. There are, however, several limitations to this study. The item regarding sleep disturbances is bi-directional while the item regarding hypertension assesses two elements of knowledge, the condition's relationship with both obesity and weight loss, and may be biased by the inclusion in the survey of a case story of a female patient presenting with high blood pressure who has previously presented for weight concerns [150, 151]. It is also important to note that, although the authors explicitly report which response they considered to be correct for each item, they do not provide evidence to support this judgement of accuracy. While it is possible for a reviewer to assess the available evidence and decide whether they agree with the authors' judgments, this information would be useful particularly in the case of disagreement.

The European Health and Behaviour Study (EHBS) employed a very different response format to the assessment of knowledge than that used by the Improving the Nutrition and Care of the Overweight Patient Survey. Participants were invited to complete a risk assessment matrix in which a number of lifestyle factors such as smoking, stress and eating fat were plotted against health conditions such as heart disease, breast cancer and lung cancer [129]. Participants were instructed to place a cross in the appropriate box if they believed that the health condition was influenced by the lifestyle factor. Each health condition-lifestyle factor combination was then treated as a discrete item. Although '*being overweight*' was included in the risk matrix as a lifestyle factor in about half of the 16,500 questionnaires completed [152], data has only been published for the French participants. In this sub-sample of 656 French university students, 81% of men and 82% of women indicated that they believed heart disease was influenced by being overweight, while 53% and 65% of men and women, respectively, believed that high blood pressure was influenced by being overweight [128]. The authors, unfortunately, only reported associations endorsed in more than 10% of respondents, and so it can be implied that less than 10% of men and women in this sample did not acknowledge the influence of being overweight on diabetes, breast cancer, mental illness, skin or lung cancer. Although the authors do mention that there were no significant differences in "...knowledge of factors related to illness" (p52, [128]), they do not discuss what associations they consider to be true. This is despite the fact that the accuracy of each health condition-lifestyle factor relationship endorsement in the EHBS has been judged against a survey of expert opinions [129]. This consisted of a self-administered questionnaire, completed by 150 senior academics at university departments of public health, epidemiology and social science in Western Europe, in which respondents were asked to indicate whether they endorsed each health condition-lifestyle factor relationship using a five-point Likert scale (definitely yes to definitely no) with an additional 'don't know' option [153]. It appears that the health condition-lifestyle factor relationships endorsed as definite or probable in more than 70% of respondents, which included coronary heart disease-bodyweight, high blood pressure-bodyweight and diabetes-bodyweight, were considered to be accurate [129]. Although the authors claim that these expert opinions "...provide a framework against which ratings generated in the EHBS could be evaluated..." (p60, [129]), they are used to judge accuracy and are, therefore, used to establish facts.

The expert opinion survey, however, has several potential limitations. Although these senior academics can reasonably be considered to have sufficient knowledge to warrant the title 'expert', their opinion is fundamentally subjective. Although the same could be said for the evidence selected by a study's authors, if this evidence was referenced it would allow a reviewer to judge whether they considered it to be balanced. In addition, participants were asked to interpret each item "...from the perspective of the informed lay person." (p196, [153]). Whether the experts' responses reflected what they believed a lay person would believe, rather than what they themselves believed, is also unknown. The results of this survey were published in 1994 but the exact dates at which the data were collected are not reported. It would only be reasonable to compare the expert opinion survey and the EHBS if data was collected during the same period of time to ensure that the responses reflected different perspectives on the same available evidence. For the same reason, it would be essential that the accuracy of responses to the IHBS risk awareness matrix are compared against responses from an up-dated expert opinion survey or evidence base.

One further important limitation of the risk awareness matrices used in the EHBS and IHBS is the use of the word 'influence' to define the health condition-lifestyle factor relationships. Endorsement has the potential to be prompted by the belief that the lifestyle factor *causes* the health condition or that the lifestyle factor *improves* the health condition.

The EHBS has been followed by the 1999-2001 International Health and Behaviour Survey (IHBS), which collected similar data on behaviours and attitudes relating to health from university students in 23 European countries. In this survey the lifestyle variable '*being overweight*' is plotted against five health conditions; heart disease, lung disease, mental illness, breast cancer and high blood pressure [152, 154]. Data is, this time, available for the whole sample and a manuscript detailing the results is currently under consideration by a peer-reviewed journal [155].

Although Bocquier *et al.* report that 'nearly all' of their participants - French general practitioners - recognised the risk of '*premature mortality*', '*type II diabetes*', '*sleep apnea*', '*hypertension*', '*increased surgical risks*', and '*phlebitis*' using a yes/no response format, they do not publish the exact item wording or quantify 'nearly all' [125]. More information is, however, given for '*infertility*' and '*some cancers*', as 53% and 45.5% of respondents, respectively, were "...unaware of the risk imposed by obesity", implying some knowledge deficits. Although the items can be criticised for failing to include any negatively worded items, the authors do provide some evidence for the fact that they consider the health conditions mentioned to represent obesity-related comorbidites, thereby allowing the assertion of truth to be critically evaluated.

In a small survey of UK health visitors and practice nurses, Green, McCoubrie and Cullingham employed the unusual item '*Which do you think carries a greater risk of metabolic disease?*' to which participants responded '*Centrally distributed excess fat*', '*Peripherally distributed excess fat*' or '*Excess body fat carries that same risks wherever it is on the body*' [156]. While this item is well written and appears to discriminate between health visitors and practice nurses, concerns can be raised regarding the suitability of the language used for a more general population.

In addition to these studies, several structured scales have also been developed which deal with knowledge about the health consequences of obesity. In 1985, Price, O'Connell and Kukulka published the psychometric properties of a general obesity knowledge scale in four different response formats [157], which has subsequently been used in several studies (e.g. [158, 159]). This consisted of a single scale of twelve items assessing a wide range of obesity-related knowledge; aspects of aetiology, related diseases, weight loss techniques and general information. It is, therefore, not surprising that the reliability coefficient, along with other psychometric characteristics of the scale, in all four response formats (multiple choice, true/false, true/false/uncertain, or five-point Likert scale) do not reach the set of standard criteria used to indicate an acceptable scale, as described in Section 2.4. In addition, the psychometric analyses were performed on data obtained from very small samples of university college students, limiting the results' generalisability. Although no information is provided regarding the multiple choice items or which response on the Likert scale they consider to be correct, the authors do clearly state whether they consider true or false to be the correct answer for each of the statements used. They report that at least three out of the four experts consulted supported these judgements and also cite evidence from five research studies; a process that they term 'test validity'. What is particularly interesting about this study is that the proportion of correct answers obtained using the True/False/Uncertain response format was lower than those obtained on the True/False format. Although it is unclear from the study as to how comparable the samples were, these results may indicate that the uncertain option was reducing the distorting effect of guessing.

One strength of Price, O'Connell and Kukulka's items is that they are fairly unambiguous, with the exception of '*People who are slightly overweight tend to live shorter lives*' in which 'slightly' has the potential to be interpreted in different ways. A more specific obesity-mortality item, which represented the only item regarding the health implications of bodyweight, featured in a previous, unreliable 8-item general obesity knowledge scale developed by Harris in 1983: '*Being even 10-15 pounds overweight decreases one's life expectancy*' [160]. Although Harris's scale was designed to be structured, the authors report that, among a sample of Australian university students, the mean score for this item was 0.89 where True = 0, Uncertain = 1 and False = 2. While Harris clearly states what response she considers to be correct - a judgement supported by ten research papers - she scores the 'uncertain' response in such a way that it indicates slightly higher levels of knowledge than an incorrect response, but not as high as a correct response. This, as discussed in Section 2.4.2.2.1, violates the assumption that knowledge is an absolute.

Block, DeSalvo and Fisher also created a general obesity knowledge measure for use among their sample of US internal medicine residents [161]. This scale contained 15 items, five of which dealt with the health effects of obesity using a true/false response format; *'Obesity by itself is a risk factor for cervical cancer'*, *'Obesity by itself is a risk factor for hyperlipidemia'*, *'Obesity by itself is a risk factor for hypertension'*, *'Obesity by itself is a risk factor for diabetes mellitus'*, *'Obesity by itself is a risk factor for sleep apnea'*. These items are particularly notable in that they specify that the obesity-health condition relationship should be judged independently of any associated risk factors. Seventy-four percent, 78%, 92%, 97% and 98%, respectively, of participants are reported as responding correctly and the authors claim that these internal medical residents have "...a solid knowledge of the comorbid conditions for which obesity is a risk factor..." (p673, [161]). However, although the authors cite the National Heart Lung & Blood Institute & National Institutes of Health's report 'Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report' [15] as the primary 'resource' for the knowledge items, they do not explicitly state which responses they consider to be correct or incorrect. Whilst this report gives some indication as to how the items were scored, the item regarding cervical cancer is difficult to assess as the NHLBI report does not refer to it.

A notable strength of Block, DeSalvo and Fisher's work is that they employed Rasch scaling in order to develop the scale, although it appears that none of the items were subsequently excluded from the final scale. Consequently, the test construction methodology has been used to confirm the scale's psychometric properties rather than truly develop it; a situation congruent with Price, O'Connell and Kukulka's general obesity knowledge scale. What is also extremely surprising is that, in spite of Block, DeSalvo and Fisher's efforts to create a psychometrically sound structured scale, the authors only treat the items in an unstructured manner, rather than creating a summative knowledge score. Only two studies have created subscales of items specifically assessing knowledge regarding the health effects of obesity as part of larger, more general scales.

McArthur, Pena and Holbert developed a structured 5-item, multiple choice subscale assessing 'The relationship between obesity and health' as part of a 25-item, self-administered obesity knowledge test, completed by 1272 9^{th} grade (i.e. ~14 years old) children from high and low socioeconomic groups in six Latin

American cities [162]. Two items assessed knowledge regarding the relationship between being overweight and cardiovascular disease, one item assessed knowledge regarding the increased health risks associated with abdominal adiposity and two items assessed knowledge regarding the benefits of weight loss for overweight individuals [163]. Each multiple-choice item had three potential answers and a 'don't know' option, with each correct answer scoring one point, each 'don't know' scoring zero points and each incorrect answer scoring minus one point. Knowledge was, therefore, once again not treated as an absolute. It is also important to recognise that no information regarding which responses the authors considered to be accurate is available, so that the reader is unable to judge the appropriateness of the authors' interpretation of the available evidence. Although the authors report that data from an initial pilot were subject to an item analysis which resulted in some modifications and that the subscales were reliable, no details are given as to the statistics observed or the cut-offs used, thereby prohibiting critical evaluation.

The mean score for each sample from high and low socioeconomic groups in each of the six cities ranged from 1.0 to 2.6 out of a possible -5.0 to 5.0, with participants with a low socioeconomic status scoring significantly lower than those with a high socioeconomic status. Although there are no criteria or norms with which to compare these scores, the authors interpret levels of knowledge regarding the health risks associated with obesity as low, and point out that it was one of the weakest areas of knowledge assessed by the total questionnaire.

Banasiak and Murr also used a multiple choice response format in order to developed a 10-item scale containing five domains which included a three item comorbidites subscale [164]. This scale was completed by a convenience sample of 2^{nd} year US medical students along with 3^{rd} year medical students who had and had not completed a Bariatric Surgery rotation. Mean percentage of correct responses in the comorbidities domain ranged between 70% and 88% with no significant differences between each of the three samples [164]. Although the authors claim that the questionnaire was validated during pilot work, no information is provided regarding the type of validity established or indeed any other psychometric characteristic. It is, therefore, difficult to assess whether the lack of significant difference between the samples was really due to similar levels of knowledge or due to the scale lacking discriminatory power. In addition, the authors do not report what answer they consider to be correct and, although appropriate for use among trainee health professionals, the language of the items is complex, for example 'anti-hyperglycemic agents'.

3.4.3 PSYCHOSOCIAL OBESITY OUTCOME EXPECTANCIES

To-date research involving cognitions regarding non-health-related aspects of obesity has focused upon the assessment of negative stereotypical attitudes towards obese people. In a review of available scales published in 1995, Yucker, Allison and Faith summarized the situation at that time as "...despite being relatively rich in applied studies, the area of attitudes toward obese persons is extremely poor in terms of measurement instruments and detailed evaluations of their psychometric properties" (p88, [132]). However, a number of structured scales with passable psychometric properties have been developed: Allison, Basile, and Yucker's Attitudes Toward Obese Persons Scale (ATOP) [131], Robinson, Bacon and O'Reilly's 50-item Fat Phobia Scale [165] which has been recently been revised to created a shorter 14-item version [166], Crandall's 13-item Antifat Attitudes Questionnaire [167] and Morrison and O'Connor's 5-item Antifat Attitudes Scale (AFAS) [168].

These scales have been developed to assess negative stereotypical attitudes towards obese people and appropriately the items focus upon a wide range of attributes, not just outcome expectancies. In order to fully capture attitudes, these scales not only assess cognitions such as *'I tend to think that people who are overweight are a little untrustworthy'* [167], but also deal with behavioural aspects e.g. *'I would never date a fat person'* [168] and *'I don't have many friends that are fat'* [167], and affective aspects, e.g. *'I really don't like fat people much'* [167]. Although these scales do include items such as *'Fat people are less attractive than thin people'* [168] which can be considered to deal with consequences of obesity and, therefore, represent outcome expectancy cognitions, items such as *'Fat people have only themselves to blame for their weight'* [168] deal much more with the causes of obesity.

In many respects, Allison, Basile, and Yucker's Attitudes Toward Obese Persons Scale (ATOP) [131] is quite different from other scales in the same genre. It focuses solely upon cognitive aspects "...as exemplars of negative attitudes toward these people" (p89, [132]). In addition, beliefs regarding causality and controllability of obesity are dealt with in a separate scale - the Beliefs About Obese Persons Scale (BAOP) [131]. Because of this, the majority of the 20

ATOP items can be interpreted as obesity outcome expectancy beliefs, for example *'Obese workers cannot be as successful as other workers'* and *'Obese people are usually sociable'*. However, items such as *'Most obese people have different personalities than nonobese people'*, while adequately measuring beliefs towards obese people, cannot be considered to be assessing beliefs regarding the consequences of obesity. Other items such as *'Obese people should not expect to lead normal lives'* are difficult to interpret in terms of outcome expectancies. Agreement could indicate a belief that the social consequences of obesity are prohibitive to normal life but could also indicate a belief that obese people do not deserve a normal life regardless of the type of life they actually have. Although the scale does not only deal with psychosocial aspects of obesity, only one item, as discussed in Section 3.4.2.1, deals with the health consequences of obesity, while one item deals with the impact of obesity in a very general way; *'One of the worst things that could happen to a person would be for him to become obese'*. Other items deal with attributes which could be considered to represent causes and/or outcomes of obesity, for example *'Obese people are more emotional than other people'*. A notable feature of the ATOP is that some attempt is made to balance the scale so that for six of the twenty items, a positive response indicates a negative attitude.

Although the ATOP has been shown to have several desirable psychometric properties including reliability, validity and readability [131, 132], the inclusion of items such as *'Most obese people have different personalities than nonobese people'* prohibits its use as an obesity outcome expectancy beliefs scale. This is because the ATOP is designed to be a structured scale where the 20 individual items are scored and combined in such a way to produce a single overall ATOP score, where higher scores indicate more positive attitudes to obese people. Interestingly, factor analysis of responses to the ATOP from 514 members of the National Association to Advance Fat Acceptance, 52 US psychology graduate students, and 72 US undergraduate students revealed a three factor structure [131]. The first factor was labelled 'Different Personalities' and reflected "...the attribution of negative or different characteristics or abilities to obese persons", the second was entitled 'Social Difficulties' and reflected "...the perception that obese people experience and/or produce social difficulties", while the third was labelled 'Self-Esteem' and contained items relating to "...how obese persons evaluate themselves" (p90, [132]). These three factors accounted for 23%, 11% and 8% of the variance, respectively. A subsequent study involving UK general practitioners and clinical psychologists (sample size unknown) also report a three factor structure for a modified ATOP labelled 'Social Difficulties', 'Self-Esteem', 'Attractiveness / Personal appeal' which accounted for 54.0% of variance [134], as did a study by Harvey *et al.* which revealed that 43.0% of the variance in ATOP scores from 187 dieticians could be accounted for by dimensions labelled 'Social Difficulties/integration', 'Self-Esteem', 'Attractiveness / Personal appeal' [169]. These findings suggest that the factor structure of the ATOP is stable across these different samples, though this is difficult to verify without detail regarding the loadings of each item. This detail would usefully reveal whether the factors could be treated as unidimensional subscales of the ATOP, i.e. each item loaded heavily upon only one of these three underlying dimensions, and whether they would be appropriate for use as obesity outcome expectancy beliefs subscales. It is important to note that the wording of the items for both the study by Harvey and Hill [134] and Harvey *et al.* [169] differed significantly from the original scale published by Allison, Basile and Yucker [131]. It is also unclear in both of these studies whether the responses to the differently worded surveys were combined in order to carry out the factor analysis.

Changes to the ATOP item wording also has implications for the scale's readability; Harvey and Hill's 'moderately overweight' and 'extremely overweight' versions [135] produce a Flesch-Kincaid reading grade of 10.4 and 11.5, respectively, and are, therefore, written in language suitable for individuals aged 15 to 16 years and over 16 years, respectively. Although Harvey *et al.*'s obese version produces a Flesch-Kincaid reading grade of 7.3, somewhat lower than the original version developed by Allison, Basile and Yucker (Flesch-Kincaid reading grade = 7.7; reading age = 12 – 13 years), their 'overweight' version [135] was written in language suitable for individuals aged 13 to 14 years. The various 'overweight' versions, therefore, are written in language that is somewhat higher than the suggested reading age of 12 years. While this is unlikely to be a problem in the samples of educated professionals, it does limit their use in more general populations.

Although the ATOP is designed to be a structured scale, data regarding the individual items is available from two studies, Neumark–Sztainer, Story and Harris [133] and Harvey and Hill [134], which allows consideration of those items identified as assessing outcome expectancies. When interpreting the responses reported in Harvey and Hill's study, more negative attitudes to moderately/extremely overweight persons indicate endorsement of the negative impacts of moderately/extremely overweight. The exception to this is the item '*Moderately/extremely overweight people are often less aggressive than normal weight people*' where endorsement indicates a negative attitude towards obese people but support for a *positive* impact of moderately/extremely overweight.

Of particular interest is the finding that on average participants endorsed the role of extreme overweight in making people feel self-conscious, inadequate, unsociable, dissatisfied with themselves and be considered as less sexually attractive and less desirable as a marriage partner. Extremely overweight persons were not considered less aggressive but were not considered to make other people feel uncomfortable. For all 20 items participants demonstrated more negative attitudes for extremely overweight than for moderately overweight. Although the authors report that for 14 items this was statistically significant, thereby indicating some construct validity, they unfortunately only specify the health and sexual attractiveness items.

In Neumark–Sztainer, Story and Harris's study, similar results were obtained. Participants indicated that they believed that obesity was associated with feeling self-conscious, inadequate, dissatisfied with themselves, and being considered not as sexually attractive and less desirable as a marriage partner. Obese people were not considered less aggressive but were not considered to make other people feel uncomfortable.

McArthur and Ross have also published results that can be interpreted as outcome expectancies, this time from an unstructured survey of US dieticians' attitudes to overweight clients [170]. Responses on a 3-point Likert Scale (strongly disagree, neither agree nor disagree, or strongly agree) to each of these items, indicate that the negative impacts of overweight were mostly neither endorsed nor rejected. The predominately neutral responses achieved may in part be due to the use of extreme categories from which to choose – 'strongly agree' or 'strongly disagree'. However, it is notable that slightly more participants endorsed the item '*Overweight clients are physically attractive*' compared to those who rejected it. This appears to contradict the findings of Harvey and Hill who reported that their participants, on average, rejected the item 'Moderately overweight people are just as sexually attractive as normal weight people'. Whether this would be a statistically significant difference and the extent to which 'physically' and 'sexually' attractive are comparable are, however, unknown. Hare *et al.* also included a single item in their survey to assess beliefs in psychosocial consequences of obesity; *'Obesity is a significant cause of personal rejection'* [121]. Unfortunately, it is not clear whether this item is measuring beliefs regarding the extent to which obese people are happy with themselves or the extent to which other people reject them. Despite this, 62% of the US fitness professionals surveyed agreed with this statement.

Although the exact item wording and response format have not been published for the 1999 Marketing and Opinion Research International (MORI) survey of attitudes towards obesity, the report claims that "...9 out of 10 adults agree that there is a great deal of stigma associated with obesity" (3rd paragraph, [139]). Although difficult to critically evaluate, this does appear to suggest that the majority surveyed believed that obese people are subjected to moral reproach from others.

The item *'Chairs are never big enough'* developed by Thompson & Thomas is unusual in that it is concerned with much more practical outcomes of obesity than psychosocial consequences, although the majority of participants, UK dietetic patients with Body Mass Indexes ≥ 30 kg/m^2, did not endorse it [136].

In Ogden *et al.*'s survey of UK general practitioners and general practice patients, participants indicated the extent to which they believed *'depression/anxiety'*, *'not feeling attractive'*, and *'not feeling good about yourself'*, were psychological consequences of obesity and *'difficulty making friends'*, *'difficulty getting work'*, and *'difficulty getting medical/surgical treatment'*, were social consequences of obesity [147]. The results suggest that, overall, general practice patients rate the psychological and social consequences of obesity higher than general practitioners. Unfortunately, the authors do not calculate summative scores from the different consequences domains in order to test this observation statistically.

Ogden, however, has produced an internally consistent psychological consequences of obesity belief scale in previous research [148]. Participants - UK female slimming club members - rated five items pertaining to *'depression'*, *'anxiety'*, *'phobias'*, *'low self-esteem' and 'lack of confidence'*, the responses to which were summed to produce the scale score. Unfortunately, the response-format is not described and so it is difficult to assess whether the scores demonstrated a significant ceiling effect.

Due to the relative lack of evidence regarding the psychological and social impacts of obesity (see Section 1.2), it is perhaps not surprising that psychosocial obesity outcome expectancies have been considered in terms of beliefs rather than knowledge. There is, however, one exception. Hankey *et al.* reported that 86% of general practitioners, 76% of practice nurses and 76% of dieticians agreed with the item *'Increasing bodyweight leads to increasing psychological problems'* [150]. The authors clearly state that they consider 'agree' to be the correct answer, but unfortunately do not support this contention with an evidence-base. As outlined in Section 1.2, even the link between obesity and psychopathology remains a debatable issue, let alone a linear association between bodyweight and psychological well-being.

3.4.4 OBESITY OUTCOME EXPECTANCIES & WEIGHT CONTROL

As suggested at the beginning of this chapter, positive beliefs in the benefits of weight control behaviour and the costs of being obese (positive obesity outcome expectancies) and negative beliefs in the costs of weight control behaviour and the benefits of being obese (negative obesity outcome expectancies) are considered to predict weight control behaviour. Several studies have assessed the relationship between responses to their belief or knowledge items and current Body Mass Index, albeit with mixed results.

Both Hankey *et al.* [150] and Price *et al.* [126] have reported that positive health-related obesity outcome expectancies were negatively correlated with respondents' Body Mass Index in univariate analysis. Kan and Tsai employed a sophisticated quantile regression analysis in order to assess the impact of health-related outcome expectancy beliefs on each quantile of their sample's Body Mass Index distribution [149]. This revealed that in men, factor scores from their scale were positively associated with BMI for those of average weight and below, and among those with very high BMIs. Men who have more positive beliefs in the health consequences of obesity are, therefore, less likely to be underweight. The authors suggest that this curious relationship might be confounded by a positive relationship between beliefs in the effects of obesity on health and nutrition knowledge. However, at the upper end of the BMI spectrum, beliefs began to demonstrate a negative association from around the 70^{th} percentile, although it did not become statistically significant until the 95^{th} centile. Among the sample of women, however, no statistically significant associations between factor scores and BMI were found at any level.

Ogden demonstrates that, although scores on her scale of beliefs regarding the medical consequences of obesity were not significantly associated with weight loss success, previously obese women who had successfully maintained their weight loss, demonstrated higher scores on the psychological consequences scale, than those who had previously lost weight but then regained it [148]. Weight loss regainers in turn demonstrated higher scores than those who had failed to lose weight, despite presumably attempting to lose weight. These findings appear to suggest a positive, 'dose-response' association between weight loss success and beliefs in the psychological consequences of obesity.

These significant negative associations do appear to offer some support for the role of obesity outcome expectancies in weight control. They are, however, contradicted by Al-Rukban's study of Saudi adolescents. Obese participants demonstrated significantly more 'correct' responses which, although not explicitly stated, presumably involved endorsing obesity's negative effect on general health, than non-obese participants. Thompson and Thomas also demonstrated that participants - UK dietetic patients - with Body Mass Indexes ≥ 40 kg/m^2, were significantly more likely to agree that *'Chairs are never big enough'* than those with BMI < 40 kg/m^2. Furthermore the overwhelming majority of reported associations have been non-significant [120, 126, 136, 142, 148-150].

One other study that is worth mentioning is the French subset of the European Health and Behaviour Survey. Monneuse, Bellisle, and Koppet rather tantalisingly report that there was a convincing significant association between "...the frequency or intensity of carrying out the behaviour and the mean rating of the associated belief..." (p50, [128]) for all 20 beliefs measured, which presumably includes *'keep bodyweight within normal limits'* and *'lose weight'*. As part of the EHBS, respondents were also asked to provide a range of sociodemographic and health-related information, including self-reported bodyweight and height, to which responses were presumably correlated, although no further detail is provided by the authors. This seems to imply that obesity saliency is associated with not being obese, though the authors do not explicitly state the direction of the belief-behaviour associations. They do, however, indicate that participants perceiving their weight to be 'underweight' or 'the right weight', rated *'keep bodyweight within normal limits'* as significantly more important than those who perceived themselves to be overweight.

The difficulty with all of these studies, however, is that BMI is assessed concurrently, or in the case of Ogden retrospectively, with the obesity outcome expectancy. Correlations between concurrent measures do not reveal the direction of any association. As discussed in Section 2.2, although cognitions are thought to predict behaviour, experience is also thought to determine cognitions. For example, in a negative correlation high levels of knowledge regarding the health risks of obesity may be promoting weight control behaviour. However, it also feasible that successfully engaging in weight control behaviour influences exposure and attention to health education.

3.4.5 OBESITY OUTCOME EXPECTANCIES LITERATURE OVERVIEW

Although obesity outcome expectancies have been investigated in a variety of studies, it is evident from this review that this construct has often been very poorly defined. In particular, beliefs are often treated as knowledge, despite their inappropriate response format. Even when knowledge is assessed appropriately, very few studies explicitly state what answer they consider correct to be. Even fewer actually provide evidence by which the reader can critically appraise this judgement. A similar situation is also evident for the belief items; few studies mention developing their items from qualitative research to ensure that their content is salient.

It is also clear that obesity outcome expectancies have, to-date, been poorly operationalized. The vast majority of items are ambiguously written and are, therefore, likely to result in measurement error. As discussed in Section 2.4.1, psychometric scales help to minimise the impact of the random error associated with each item and, therefore, improve reliability. Unfortunately, very little of the research has employed sets of related items by which to measure obesity outcome expectancies. When scaling is employed, the measures produced tend to have very broad content, thereby limiting conclusions that can be drawn about particular constructs of interest. Notable exceptions to this are the obesity risk knowledge subscales developed by Banasiak and Murr [164] and McArthur, Pena and Holbert [162], and Ogden's beliefs in the medical and psychological consequences of obesity subscales [148]. It is clear, however, that none of these fulfil the requirements of reliability, unidimensionality and validity.

What is evident from the literature presented is that many authors have established the face and content validity of their questionnaires in pilot work. This perhaps suggests that, while many authors are conscious of the need to fulfil the requirements of measurement theory, they do not have sufficient resources to undergo the rigorous test construction procedures outlined in Section 2.4. It is also unfortunate that relatively few studies explicitly state that they have established basic validity. Discussing the study with reference to measurement theory may help the readers' critical evaluation and help to improve the quality of research in this field.

The lack of universally accepted, psychometrically sound measures of obesity outcome expectancies has led authors to develop a huge range of items specific to their study. Although the majority of studies cite previous research as guiding the development of their assessment tools, items are rarely used again in future research. This seriously limits the comparisons that can be made across studies.

It is also clear that the majority of research is descriptive and has been conducted on practicing or trainee medical professionals, predominately in the United States. What is striking about these studies is that very little reference is made to *why* obesity outcome expectancies are being described in these samples. Explicitly placing research in the context of theory may also help to improve the quality of research in this field. In addition, prospective research is required to fully determine the role of obesity outcome expectancies.

One of the major problems with reviewing literature in this field is the lack of detail presented in research papers. It may be that, in order to conform to journal requirements, information cannot be presented in the main publication. Alternatively, authors may just not value the psychometric properties of their measures. Either way, research in this field would be hugely improved by the provision of such information – perhaps as on-line appendices.

3.5 THE ROLE OF OUTCOME EXPECTANCIES IN OBESITY TREATMENT & MANAGEMENT

3.5.1 CURRENT OBESITY TREATMENT & MANAGEMENT

Although it is evident that research to date has not adequately investigated the role of obesity outcome expectancies in weight control behaviour, they are implicated in treatment approaches such as cognitive-behavioural therapy as well as interpersonal (person-to-person) and impersonal (mass communication) health education and promotion practices.

While cognitive-behavioural obesity treatments can, and do, include a combination of different strategies, for example stimulus control, goal-setting, self-monitoring and modifying aversive thinking patterns [171], a key concept of cognitive-behavioural therapy (CBT) is to promote and maintain the participant's motivation for change [172]. Cooper, Fairburn and Hawker suggest that to overcome ambivalence, the obese patient and therapist should produce and discuss a list of pros and cons for treatment [173]. They also advise the therapist to discuss the health risks associated with obesity "...in the spirit of informing patients about the condition rather than scaring them" (p34, [173]). In a recent Cochrane review of randomised controlled clinical trials, Shaw and colleagues concluded that behavioural and cognitive-behavioural strategies were the most commonly used psychological interventions for overweight and obese and were shown to enhance weight reduction, particularly when combined with dietary and exercise strategies [174]. Unfortunately there is a paucity of data on CBT in obesity treatment and methodological differences, particularly the central role of the therapist, make it difficult to determine how effective strategies such as discussing pros and cons for treatment are.

In the North American National Heart, Lung and Blood Institute Clinical Guidelines for the Identification, Evaluation and Treatment of Overweight and Obesity, one of the evidence statements made is that "Patient motivation is a key component for success in a weight loss program" (p110S, [175]). They go on to recommend that "Practitioners need to assess the patient's motivation to enter weight loss therapy; assess the readiness of the patient to implement the plan, and then take appropriate steps to motivate the patient for treatment" (p110S, [175]). Outcome expectancies play a central part in this assessment as it is suggested that reasons and motivation for weight loss, along with the patient's understanding of how adiposity, contributes to obesity-associated diseases are evaluated (positive obesity outcome expectancies). Factors such as the amount of time and money the individual is willing (and able) to commit to therapy, along with other obstacles that will interfere with the patient's ability to implement change (negative obesity outcome expectancies), should also be considered [175]. The NHLBI suggests that "...it is the duty of the primary care practitioner to heighten a patient's motivation for weight loss..." and they believe that this can be achieved by "...enumerating the dangers associated with persistent obesity..." but do not explicitly state the role of decreasing barriers (p110S, [175]). Numerous studies have suggested that medical professionals do indeed feel obligated to discuss health risks with obese patients (e.g. [120, 126, 144, 176]) and use it as their primary treatment approach [124].

In addition to interpersonal individual-orientated interventions, health education and promotion is also possible through mass communication; a strategy that is likely to be more cost-effective with large populations [177]. Although a number of obesity-related large scale community-based health education interventions have been conducted, for example the Stanford Five-City Project [102], the Minnesota Heart Health Program [178], the Pawtucket Heart Health Program [179], and the Pound of Prevention study [180], these have not shown to consistently or appreciably reduced the prevalence of obesity [181]. While these findings have been used to justify the use of environmental strategies over individual-orientated strategies to manage obesity (e.g. [40, 182, 183]), there are a number of important limitations to this interpretation. For example, with the exception of the Pound of Prevention study, all of these studies are multi-component cardiovascular disease interventions and do not predominately deal with weight control behaviour. As Jeffery points out, simultaneous messages about multiple behaviours may dilute the attention paid to any particular goal [178]. In addition, they have primarily focused upon weight loss and weight maintenance *strategies* rather than obesity outcome expectancies [181]. As Jebb, Lang and Penrose highlight "There is a temptation for scientists and journalists to leap to providing action-orientated messages, yet the majority of the population has not yet reached this stage of change, and hence the information fails to initiate change" (p579, [184]). Even when the intervention has aimed to increase knowledge regarding CVD risk factors, a significant increase in knowledge regarding the CVD risk associated with obesity has not been demonstrated in treatment samples compared to control samples [102, 185]. It is entirely feasible that the intervention failed to influence bodyweight because it failed to influence obesity-related knowledge – not because obesity-related knowledge failed to influence weight control behaviour. It is also important to recognise that these interventions have all taken place without the supportive, environmental changes which are considered to be essential for effective obesity-related health education [186].

On a much smaller scale, although recently conducted in the UK, the BBC's 'Fighting Fat, Fighting Fit' mass media campaign has demonstrated that, over a 6 month period, those individuals who registered their details reported a significant reduction in weight [187]. Although the study does not assess changes in obesity-related outcome expectancies, it is "...designed to inform people about the need for active obesity prevention" (p343 [188]) and is based upon behaviour change theories including the Health Belief Model.

The role of obesity outcome expectancies in community-based health education is, therefore, far from clear. Levels of knowledge regarding the health risks associated with obesity in UK are generally considered to be inadequate [184, 189, 190] and the communication of health risk knowledge has received some support in the academic literature [184]. It is a central feature of a national obesity awareness campaign proposed in the recent Government White Paper 'Delivering Choosing Health: making healthier choices easier' [43]. In addition to its postulated role in determining weight control behaviour, knowledge is also important to ensure that individuals make informed decisions regarding their health [191].

Despite the contention expressed earlier that non-health-related and negative outcome expectancies are likely to be important in the prediction of weight control behaviour, so far the focus of obesity treatment and management appears to be on positive outcome expectancies

3.5.2 LESSONS FROM SMOKING OUTCOME EXPECTANCIES

While smoking behaviour differs from weight control behaviour in several aspects, for example it is associated with important social benefits such as peer acceptance it makes an interesting comparison for obesity. Not only does it represent an important cause of preventable illness and premature death in England [192], it involves a change away from current lifestyle rather than engaging in a novel, discrete behaviour such as attending a screening appointment. Smoking-related outcome expectancies have also been the focus of academic research and of numerous anti-smoking campaigns which provides some clues as to the true potential of this construct in the prevention and treatment of obesity.

Several studies have demonstrated that outcome expectancies, as assessed by psychometric scales, predict future smoking behaviour in accordance with Expectancy Value and Subjective Expected Utility Theory (e.g. [193, 194]). One laboratory study has even demonstrated that an increase in beliefs regarding the health risks associated with smoking promoted stage of change and predicted a reduction in smoking at the three month follow-up [195].

During the 1990s, the strategies employed by anti-smoking mass media campaigns in England have varied. Between 1992 and 1994, the *John Cleese* television campaign was run, and evaluated, regionally before being run nationally between 1994 and 1995 [192]. During the development of this campaign, qualitative research was conducted to explore the reactions of smokers, ex-smokers and non-smoking partners of smokers to a number of different communication strategies [192]. This research identified a number of messages for inclusion in anti-smoking campaigns which were dominated by health-related outcome expectancies. The health effects of smoking were considered to be major motivating factors and the use of health-risk messages in anti-smoking campaigns were supported by nearly all respondents [192]. The health benefits of not smoking, particularly in the short-term, were also considered to be motivating. In addition, respondents identified the 'knock-on effect' of the health implications associated with smoking both on the individual and significant others, particularly children, as important [192]. The *John Cleese* television campaign, therefore, aimed to deliver health-risk messages alongside messages designed to build self-efficacy, provide advice about giving up smoking, and display understanding for the difficulties associated with smoking cessation attempts. The advertisements used morbid humour to convey the campaigns messages as it was thought to have "...the potential for delivering hard-hitting health-risk messages in an unexpected and non-threatening way to smokers and, as such, could be used to get smokers on side." (p15, [192]). This campaign was evaluated using independent TV regions in central and northern England; three intervention sites were exposed to the TV campaign only, one intervention site was exposed to the TV campaign plus a local health promotion, while one region did not receive any advertisements or health promotion and acted as a control [196]. At base-line participants (n = 5468) were interviewed and classified as smokers and ex-smokers. Participants were re-interviewed and, where appropriate, re-classified as having stopped smoking or relapsed after 6 months (n = 3610) and 18 months (n = 2381), following the first and second phases of the TV campaign. After adjusting for base-line characteristics predictive of change in smoking status, i.e. demographic variables and factors such as worrying about the health effects of smoking and wanting to give up smoking, the TV campaign alone was estimated to have increased the odds of not smoking (i.e. smokers giving up and ex-smokers remaining abstinent) by 53% (95% CI 1.02 – 2.29; $p < 0.05$) at the 18 month follow-up, compared to the control group. The health promotion intervention conferred no additional advantage. While the evaluation suggests that this outcome expectancy-based anti-smoking campaign was effective in promoting smoking cessation and preventing relapse, it is impossible to isolate the impact of the various messages used. As mentioned, health-related outcome expectancies was only one, albeit a key construct targeted by the campaign; self-efficacy, cessation advice and support were also taken into account. Although a study design with multiple interventions could compare the impact of separate constructs on smoking behaviour, this scientific approach is considered inappropriate for large-scale, 'real-world' interventions [197]. However, a useful outcome measure to include in the study would have been pre- and post-intervention measures of cognitions such as knowledge, beliefs and attitudes regarding the health risks associated with smoking. Although appropriate changes in target cognitions would not prove that individual messages prompted the observed behaviour change, it would have indicated that constructs were at least being modified. Cognition change was not considered as an outcome measure but post-intervention focus groups were conducted with a broad range of smokers and ex-smokers [192]. These revealed that the campaign was motivating and generally well-received, despite dealing with potentially threatening health-risk messages. The campaign's acceptability was attributable to the use of humour and the avoidance of the 'patronising' or 'scaremongering' tactics associated with previous health education campaigns.

Despite the *John Cleese* anti-smoking campaign's efficacy and acceptability, health risk messages were not included in the Health Education Authority's subsequent television and poster campaign, *Break Free*, which ran between 1995 and 1996. In this less extensive campaign the emphasis on health-related outcome expectancies was replaced by messages that aimed to provide motivation for those who wanted to stop smoking or had already stopped by portraying smokers successfully quitting in "...an uplifting and empathetic fashion" (p21 [192]), i.e. promoting self-efficacy. Unlike the *John Cleese* campaign, *Break Free* was not subjected to quantitative evaluation. However, post-test qualitative research was conducted with the 'target audience' of smokers either wanting to quit or ex-smokers. This revealed that *Break Free* had very little impact on participants; recall of the campaign's messages was poor while its emotional impact was limited. Interestingly, the advert which provoked the most emotional response, and was therefore considered the most successful, emphasised health-related outcome expectancies in terms of the improved physical fitness and activity levels associated with quitting.

Outcome expectancies were re-introduced into anti-smoking mass media education in England when the *Break Free* campaign was replaced by the *Quit for Life* campaign which ran between 1996 and 1997. This campaign harnessed television to deliver messages regarding the benefits of being a non-smoker and radio to identify with the difficulties associated with quitting and to provide practical support and advice. Once again, in qualitative research conducted during the campaign's development, participants highlighted the motivational role of outcome expectancies even though they acknowledged that the advantages of not smoking and the disadvantages of smoking were widely accepted [192]. However, rather than focus on the health risks associated with smoking, the campaign focused on more positive messages regarding the benefits of not smoking and involved two television adverts; the successful, health-related outcome expectancy advert mentioned earlier which formed part of the *Break Free* campaign and one called *Life* which is described as "...a montage of positive, inspirational images designed to show people enjoying life as non-smokers." (p28, [192]). The outcome expectancy messages involved in the television broadcasts were accompanied by radio messages aimed to promote self-efficacy. Qualitative evaluation, however, revealed that few participants were aware of both the television and radio campaigns. In addition, while participants were extremely positive about the radio advertisements, the *Life* television advertisement made very little impact. While this advert was viewed positively, it did not engage participants emotionally. The lack of specificity regarding the health benefits associated with not smoking meant that the central message was not conveyed.

In 1997, the role of outcome expectancies in anti-smoking mass media health education in England altered once more with the introduction of the *Testimonials* campaign which ran on television, radio and in the press between 1997 and 1998 and, in a slightly modified version, between 1998 and 1999. The *Testimonials* campaign was specifically aimed at a young age group (16 – 24 years) than those targeted in the previous campaigns described (25 – 44 years). Testimonials of real-life smokers with smoking-related diseases were used to convey personally relevant communications regarding the short- and long-term health risks associated with smoking. Qualitative research following the first phase of the campaign (1997 – 1998) involving smokers and recent ex-smokers aged 16 to 44 suggested that participants found the campaign had a strong emotional impact while the messages were difficult to ignore or deny. Interestingly, participants generally supported this challenging, aggressive approach as a means of 'jolting' smokers into a fresh awareness of the health risk of smoking, thereby increasing their motivation to quit. This is, to some extent, supported by the finding that 71.4% of all calls to a telephone helpline for smokers and ex-smokers, *Quitline*, which were transferred to a counsellor throughout one year were made during the 3 month period in which the television advertisements were shown [198]. The justification for hard-hitting messages was supported by further qualitative research conducted during the development of phase two of the campaign (1998 – 1999) in which participants responded more positively to those testimonials with dramatic or highly emotional elements [192].

The use of testimonials from real-life smokers suffering the health consequences of smoking has also been incorporated into the current Department of Health's *'Don't give up giving up'* campaign which was launched in December 1999 (www.givingupsmoking.co.uk). The *'Don't give up giving up'* campaign aims to use "...a realistic but supportive approach" and to offer smokers attempting to quit "...support and encouragement" [199] through services such as the NHS Smoking Helpline, local NHS Stop Smoking Services and Nicotine Replacement Therapy on prescription alongside health education. While the focus of the campaign's objectives appear to be on facilitating the process of quitting, health risk messages continue to dominate the television advertisements. In addition to the use of testimonials, the indirect impacts of smoking and smoking-related diseases on children are also emphasised.

The use of health risk messages is not only supported by non-government organisations in the UK [200], but also by a World Health Organization and Centers for Disease Control and Prevention review of international anti-smoking campaigns [201]. Using both published and unpublished qualitative and quantitative data from ten countries, conclusions were drawn regarding targeting, messaging, media presence and campaign measurement. In terms of message content, successful campaigns were found to be widely effective if they incorporated health risk information in 'persuasive' and 'innovative' ways, for example through the use of emotional jolts [201]. However, the authors clearly point out that provocative messages should not be used with impunity, but should be supported by data establishing their effectiveness. They also recognise that delivering these emotional jolts with respect and understanding is challenging. In addition to communications regarding the direct impacts of smoking on health, the indirect effects of smoking and smoking-related disease on other people are thought to be well-accepted and motivating. In addition to these 'why quit' messages, 'how to quit' messages are also effective. In particular, the provision of helpline messages is thought to "...offer a valuable balance to a health risk message; it gives the smoker a relatively easy first step to take in responding to the new understanding of risk." (p3, [201]).

The focus on health-risk messages in anti-smoking campaigns in the UK looks likely to continue in the future with the Department of Health, in its recent White Paper 'Delivering Choosing Health', proposing "...a boosted campaign to reduce smoking rates and motivate smokers in different groups to quit; supported by clear and comprehensive information about health risks, reasons not to smoke, and access to NHS support to quit; including Stop Smoking Services and nicotine replacement therapy" to be achieved by "...hard-hitting campaigns building on success achieved" (p60, [43]). However, the most recent anti-smoking mass media health education to be launched by the NHS in August 2005 is intriguingly entitled Motivations that Matter in which "The message to males is that they risk their ability to perform sexually. The campaign highlights to female smokers the damaging impact smoking can have on their appearance and attractiveness" [202]. It will certainly be interesting to observe whether this novel focus upon psychosocial outcome expectancies will have the desired effect upon smoking behaviour.

Both academic research and health education campaigns have, therefore, demonstrated that outcome expectancies provide useful constructs to predict and change smoking behaviour. As smoking behaviour has some important parallels with obesity-related behaviour, this helps justify further investigation into obesity outcome expectancies.

3.6 THE NEED FOR PSYCHOMETRICALLY SOUND MEASURES OF OBESITY OUTCOME EXPECTANCIES

As originally described by Expectancy Value Theory [56] and Subjective Expected Utility Theory [57], outcome expectancies are thought to predict behaviour and represent a central feature of current health behaviour research. Several studies have, for example, demonstrated that outcome expectancies predict smoking cessation and have been manipulated successfully in cost-effective, mass-media anti-smoking campaigns. Although obesity outcome expectancies are implicated in some obesity treatment and prevention strategies, their role in predicting weight control behaviour is yet to be established. Psychometric scales can be used to assess individual differences in psychological constructs but currently no measure of obesity outcome expectancies adequately fulfils the requirements of measurement theory. Generic, psychometrically sound measures of obesity outcome expectancies would, therefore, have a wide range of potential uses, for example to:

1. Investigate the relationship between obesity outcome expectancies and weight control behaviour as suggested by Expectancy Value Theory [56] and Subjective Expected Utility Theory [57]. If obesity outcome expectancies were shown to predict weight control behaviour, this would justify the use of individual-orientated health promotion strategies in the prevention and treatment of obesity and have implications for the distribution of resources.

2. Evaluate the effectiveness of health education intervention, both clinical and population-based, that aim to modify obesity outcome expectancies. Although the goal of health promotion is to change behaviour, it has been argued that the most appropriate outcome measure for evaluation is cognitive changes [203].

3. Investigate the relative contribution of health- and non-health-related obesity outcome expectancies to the prediction of weight control behaviour in different populations, thereby allowing interventions to be targeted at the most salient beliefs and increasing efficiency.

4. Empirically compare, along with psychometric sound measures of other constructs, current social cognition models of health behaviour in order to

advance Health Behaviour Theory as recently suggested by Noar and Zimmerman [71].

5. Investigate the extent to which health professionals' obesity outcome expectancies affect their treatment of obese patients and their patients' cognitions. If health professionals' obesity outcome expectancies are found to impact on their patients, this would have important implications for the education and training that trainee medics and allied health professionals receive. This is particularly true in view of the evidence that the majority of US obstetrician-gynecologists surveyed thought that their training on the health consequences of obesity was inadequate to non-existent during residency, while a third thought the same during their time at medical school [127].

CHAPTER FOUR:
OBESITY RISK KNOWLEDGE SCALE DEVELOPMENT

4.1 CHAPTER FOUR INTRODUCTION

As discussed in Section 3.6, generic, psychometrically sound measures of obesity outcome expectancies would have a wide range of important clinical, professional and scientific applications. Due to the widespread, international consensus among the scientific and medical community that obesity is a significant risk factor for a number of life-threatening and debilitating physical health conditions, beliefs in the health risks associated with obesity can be treated as knowledge.

The literature review under-taken in Section 3.4 has revealed two scales, developed by Banasiak and Murr [164] and McArthur, Pena and Holbert [162], that assess obesity health risk knowledge. Although these sets of related items are likely to minimise each item's measurement error, neither study reports a measure of internal consistency such as Cronbach's Alpha coefficient. McArthur, Pena and Holbert, however, do report content and face validity, while Banasiak and Murr report some unspecified kind of validity involving a t-test, presumably face validity, established with a small pilot sample. Although future studies may, therefore, aim to establish the psychometric properties of these existing scales, they are limited by the use of a response format which has a high respondent load. Excessive demands may adversely influence the participants' motivation to complete the scale. However, as discussed in Section 2.4.2.2.1, a true/false/uncertain response format represents a reliable and user-friendly method of assessing detailed, factual knowledge.

Creating such a scale for obesity health risk knowledge would, as outlined in Section 2.4, require the development of an item pool, followed by a pilot-study to select the most appropriate items based upon their psychometric properties. It is also recommended that a second pilot is conducted to ensure that the scale's psychometric properties are stable and not the product of chance.

4.2 CHAPTER FOUR AIM

To develop a brief, reliable and valid measure of knowledge regarding the health effects of obesity.

4.3 STUDY ONE: ITEM POOL DEVELOPMENT

4.3.1 STUDY ONE AIM

To create a representative, unambiguous pool of knowledge items from which to develop the Obesity Risk Knowledge Scale.

4.3.2 ITEM CONTENT

A 26 item pool assessing knowledge of both the health risks associated with obesity and the health implications of weight change for the obese was developed based upon the evidence presented in four major reports on obesity; the World Health Organization's 'Obesity: preventing and managing the global epidemic' [5], the British Nutrition Foundation's 'Obesity. The report of the British Nutrition Foundation's Task Force' [190], the World Cancer Research Fund's 'Food, nutrition and the prevention of cancer: a global perspective' [204] and the National Audit Office's 'Tackling obesity in England' [18] (Table 4.1). The guiding principles outlined in Section 2.4.2 were employed to ensure that, as far as possible, items were unambiguous and unidimensional. In addition to obesity's effect on health in general, items also assess knowledge of obesity's effect on a number of established co-morbidites including cardiovascular disease, cancer and type 2 diabetes mellitus. The obesity-related co-morbidities used in the items were selected as meaningful examples of the wide variety of physical health consequences of obesity on the basis that a) obesity was a significant risk factor to the condition, b) they were common conditions in the UK population, c) they significantly added to the burden of disease, and d) the medical terminology could be adequately expressed in lay terms.

To ensure that the medical conditions mentioned in the items were written in appropriate language for a general population, a dietician independent to the study was consulted. Perhaps the most significant suggestion made was to use 'diabetes late in life' instead of 'type II diabetes mellitus'.

In some cases, more than one item was created to assess a particular aspect of knowledge, for example items 8 ('It is better for a person's health to have fat around the hips and thighs than around the stomach and waist'), 11 ('A person with a 'beer-belly' shaped stomach has an increased risk of developing diabetes in later life') and 23 ('In terms of health, it is better for a person to have an 'apple' shape rather than a 'pear' shape'). This was to ensure that the most appropriately worded items would be selected for the final scale.

In addition to these established obesity-related co-morbidities, a number of items focused upon medical conditions for which obesity is not considered to be a risk factor; migraines, food allergy, TB (tuberculosis), 'flu (influenza), hay fever and lung cancer. The use of the relationship between these health conditions and obesity as 'false knowledge' items is supported by the major international reviews of the health consequences of obesity, which universally fail to mention them, and by literature searches for primary evidence.

To ensure that the item pool was balanced in terms of the number of items for which 'false' could be considered the correct answer, a number of items for which a negative response (False) indicated a positive answer (Correct) were also generated. In an attempt to ensure that these items were as simple as possible, the negative relationship was highlighted using bold font, for example item 15 'Obesity does **not** increase the risk of developing high blood pressure'.

4.3.3 RESPONSE ACCURACY & SCORING

All items were designed to be self-administered and had a True/False/Uncertain response format. As discussed in Section 2.4.2.2.1, this format offers a reliable and user-friendly method of assessing detailed knowledge. The 'True' and 'False' responses to each item were classified as either correct or incorrect (Table 4.1) on the basis of evidence from reputable reports on obesity and select primary evidence (Appendix One). 'Uncertain' responses were systematically considered to represent an absence of accurate knowledge and where given the equivalent score as an incorrect response. For the 14 items where 'True' was the correct response (e.g. 'Obesity increases the risk of developing breast cancer after the menopause'), responses were, therefore, scored as 'True' = 1, 'Uncertain' = 0, and 'False' = 0. For the 12 items where 'False' was the correct response (e.g. Obese people can expect to live as long as non-obese people), responses were scored as 'True' = 0, 'Uncertain' = 0, and 'False' = 1. In this way, knowledge is appropriately considered as an absolute (Section 2.4.2.2.1).

The Obesity Risk Knowledge Scale is designed to be a norm-referenced instrument, i.e. to be used to compare groups of individuals by placing them along a continuum of the construct in question [77]. In the future, appropriate criteria may be applied to the scores

4.3.4 READABILITY

The item pool was written in language suitable for individuals aged 14 years and above (Flesch-Kincaid Reading Grade [82] of 9.4; UK equivalent = Year 10 – 11). Omitting the term 'obesity' from the analysis produces a Flesch-Kincaid Grade Level of 8.2, which implies that the scale may be more accurately said to be suitable for individuals aged 13 years and above.

4.3.5 CONTENT VALIDITY

Ten academic and clinical experts in the field of obesity were contacted in order to establish the item pool's content validity, i.e. the extent to which the items are a well-balanced sample of the content domain to be measured [54], and to provide general feedback. These experts were sent all 26 items in the form of a questionnaire with correct responses indicated. Out of the seven replies, one expert provocatively stated "I am unconvinced that this will prove a useful tool – prove me wrong!". In terms of the analysis, this respondent was interpreted as not endorsing any of the items. Two experts were much more positive in their appraisal and stated "As far as I can see, the questionnaire meets its purpose very well and I see no reason to edit or reclassify any of the questions" and "These all seem appropriate. I will enjoy seeing the results". The remaining four respondents endorsed some items and not others and offered a range of comments (Table 4.2). One general comment made by expert 1 was that items 7, 10, 19, and 21 were all concerned with "allergy/immune function" and queried whether this was "a bit of overkill".

Overall, half of the items were endorsed by six out of the seven respondents (Items 3–7, 12, 14, 16–17, 20, 22, 24, 26) while the 23 items (88.5%) were endorsed by at least five respondents.

This feedback provided adequate face and content validity to justify further development of the scale. Although no modifications were made to the items in response to this feedback *prior* to the pilot study, with the exception of the typographic error in item 3, these data informed the selection of the items after the pilot study and will be discussed in more depth in Section 4.4.4.2.6.

Table 4.1 Obesity Risk Knowledge Scale Item Pool

1	In terms of health, it is worse for a person to be obese than to smoke.	False
2	Obesity increases the risk of developing diabetes in later life.	True
3	The medical recommendation is that obese people should loss weight slowly, around 1-2lbs (½-1kg) a week.	True
4	Obese people can expect to live as long as non-obese people.	False
5	Obesity increases the risk of developing breast cancer after the menopause.	True
6	There is **no** significant health benefit if an obese person who has developed diabetes in later life, loses weight.	False
7	Obesity increases the risk of developing migraines.	False
8	It is better for a person's health to have fat around the hips and thighs than around the stomach and waist.	True
9	Rapid weight loss in obese people is **not** associated with any health problems.	False
10	Obesity increases the risk of developing a food allergy.	False
11	A person with a 'beer-belly' shaped stomach has an increased risk of developing diabetes in later life.	True
12	Obesity increases the risk of developing bowel cancer.	True
13	Gradual weight gain throughout adult life increases the risk of developing TB (tuberculosis).	False
14	Gradual weight gain throughout adult life increases the risk of heart disease.	True
15	Obesity does **not** increase the risk of developing high blood pressure.	False
16	Obesity increases the risk of having a heart attack (a myocardial infarction).	True
17	Obesity is more of a risk to health for people of South Asian (e.g. Indian and Pakistani) descent than people of European descent.	True
18	Smoking causes more premature deaths a year than obesity.	True
19	Obesity increases the risk of developing 'flu (influenza).	False
20	It is healthier to be obese and keep the same weight than frequently gaining and losing weight ('yo-yoing' in weight).	True
21	Obesity increases the risk of developing hay fever.	False
22	In terms of health, it is better to stop smoking even if this results in weight gain.	True
23	In terms of health, it is better for a person to have an 'apple' shape rather than a 'pear' shape.	False
24	Obesity does **not** increase the risk of developing lung cancer.	True
25	An obese person who has developed diabetes late in life would need to lose at least 40% of their body weight to have a significant health benefit.	False
26	Avoiding obesity throughout adult life reduces a person's risk of developing heart disease.	True

Table 4.2 Obesity Risk Knowledge Scale Item Pool Content Validity Feedback

Item	No. endorsing	
1	5	Expert 6: Quantification of smoking probably necessary as there are people smoking only 2 or 3 cigarettes per day
2	5	Expert 1: Should say type II diabetes
3	6	Experts 1 & 3: Point out typo 'loss'
8	4	Expert 1: Should add 'extra' or 'excess' fat Expert 2: ? negative question
9	5	Expert 6: Two negatives
10	5	Expert 2: ?
11	5	Expert 6: Compared to whom?
13	2	Expert 1: Not obvious why chosen Expert 2: ? Expert 3: Are there some more important/interesting questions you need to include rather than use this one? Expert 6: The clinical importance for the everyday person knowing that TB is less prevalent in obesity is doubtful
15	5	Expert 3: I would reword this to be 'increases' – double negative
18	5	Expert 1: Ambiguous as relative risk
19	4	Expert 2: ? Expert 6: Are you sure obesity does not increase the risk of developing flu?
21	5	Expert 2: ?
23	5	Expert 2: ✓ but need to define
25	5	Expert 7: contains a very detailed percentage which detracts from the important issues

4.4 STUDY TWO: INITIAL SCALE DEVELOPMENT

4.4.1 STUDY TWO AIMS

1. To develop a short, reliable scale to assess knowledge regarding the physical health consequences associated with obesity.
2. To conduct a preliminary investigation into the resulting scale's criterion validity.

4.4.2 STUDY TWO METHOD

4.4.2.1 Study Design

A cross-sectional survey.

4.4.2.2 Sampling

Opportunistic sampling was used to recruit individuals with a range of obesity-related education and expertise. Those invited to participate included:

1. 1st year medical students attending a Behavioural Sciences in Medicine Module lecture at the University of Nottingham on Tuesday, 8th January 2002 (n = 116).
2. Members of staff at John Lewis Nottingham visiting the canteen during the lunch-time period on Thursday, 23rd May 2002 (n = 389). John Lewis Nottingham is one of 26 department stores owned by The John Lewis Partnership and is located in the East Midlands. The store has a full-time Occupational Health Advisor responsible for a wide range of staff health and safety issues.
3. 2nd year nutrition students attending a Psychology, Sociology and Nutrition Module lecture at the University of Nottingham on Thursday, 5th January 2002 (n =11).
4. Delegates attending a British Nutrition Foundation conference entitled 'Nutrition: Communicating the Message' in London on Thursday, 30th May 2002 (n = 133).
5. Committee members of the Association for the Study of Obesity in September – October 2002 (n = 30).
6. Academic staff in relevant health-related disciplines at the University of Nottingham in September - October 2002 (n = 7).

4.4.2.3 Measures

4.4.2.3.1 Obesity Risk Knowledge Scale Item Pool

Respondents completed the 26-item Obesity Risk Knowledge Scale Item Pool as described in Section 4.3.

4.4.2.3.2 Sociodemographic Characteristics

A series of unstructured items were used to obtain details of age, gender, ethnicity and level of education. Marital status was also assessed in all participants except first year medical students. Occupation was obtained using a free response question and status coded using the National Statistics Socio-economic Classification (NS-SEC) [205]. Respondents were also asked to record their current height and weight from which self-reported Body Mass Index (kg/m^2) was calculated.

4.4.2.4 Procedures

4.4.2.4.1 Data Collection

1st year medical students and 2nd year nutrition students:

The study was introduced by the lecturer and questionnaires distributed, completed immediately and returned within a ten-minute break in the lecture. Each questionnaire was also accompanied by a covering slip briefly explaining the study and providing contact details. Responses were completely anonymous and no incentives were offered.

John Lewis Nottingham staff members:

One week prior to the distribution of the questionnaires, an article was placed in the weekly Jessops Chronicle internal newspaper while posters were displayed on the Occupational Health pin-boards in order to promote the study and give individuals a chance to consider their participation. Staff members were approached as they entered the staff canteen over the lunch-time period, given an information sheet and invited to visit an area set aside to complete a questionnaire. All responses were completely anonymous and each questionnaire was distributed, completed and returned immediately to the researcher. Each participant was also given a raffle ticket and could enter a prize draw to win a £10 John Lewis gift voucher.

British Nutrition Foundation conference delegates:
Each delegate received a letter as part of their delegate pack explaining the study and inviting them, during the tea and lunch breaks, to visit an area set aside to collect an information sheet and complete a questionnaire. All responses were completely anonymous and each questionnaire was distributed, completed and returned immediately to the researcher. No incentives were offered.

Association for the Study of Obesity committee members and University of Nottingham academic staff:
Committee members (September – October 2002) and selected University of Nottingham academic staff received a covering letter, information sheet and questionnaire via mail and were invited to return their completed questionnaires in free-post envelopes. All responses were completely anonymous and no incentives were offered.

4.4.2.4.2 Data Analysis

All data analyses were conducted using SPSS (Version 11.5). The data from the initial item pool were subjected to a 'Maximization of Internal Consistency'-type item analysis as described in Section 2.4.4.2.2 in order to remove unreliable and non-discriminating items. An acceptable p-value was considered to fall between 0.1 and 0.9 and Cronbach's Alpha Coefficient ≥ 0.7. Scores on the retained items were then considered in terms of criterion validity using univariate and multivariate statistics.

4.4.2.5 Ethical Considerations

This study received approval from the Nottingham University Medical School Ethics Committee (Appendix Three). Individuals were considered to have consented to their participation in the study if they completed and returned a questionnaire. All responses were anonymous.

4.4.3 STUDY TWO RESULTS

4.4.3.1 Response Rate

Of the 686 people invited to participate in this study, 316 responses were received, resulting in a response rate of 46.1%. Returned responses were, however, excluded from the analysis if the respondent had indicated they had trouble reading English (n = 5). As no item from the 26 item pool was missing more than 5 values (1.6%), the 28 cases with missing values were also deleted from the data set, resulting in a sample size of 283 and a useable response rate of 34.7%.

4.4.3.2 Respondents' Characteristics

Within the sample of 283 useable responses, participants ranged in age from 16.7 to 59.7 years (n = 279, mean = 31.7 years, s.d = 13.0 years). The majority of this sample were female (n = 199, 70.3%), White British / European (n = 250, 88.3%) and had received some higher education (n = 194, 68.6%). The majority of participants were full-time students (n = 122, 43.1%), while among non-students, all three social classes were represented; managerial and professional occupations (n = 72, 25.4%); routine and manual occupations (n = 57, 20.1%); intermediate occupations (n = 25, 8.8%). Information regarding marital status were not collected for first year medical students, but in the 175 participants for whom data were available, 116 (41.0%) were married / co-habiting. The majority of participants' self-reported Body Mass Index was within the range of 18.5–25 kg/m^2 (n = 197, 69.6%), although a sizeable proportion exceeded the recommended BMI of 25 kg/m^2 (n = 63, 22.3%).

4.4.3.3 Item Analysis

4.4.3.3.1 Stage 1: Item Semantics

Before data were subjected to the traditional item analysis, six items were removed from the 26 item pool due to content considerations. Items 1 ('In terms of health, it is worse for a person to be obese than to smoke', 18 ('Smoking causes more premature deaths a year than obesity') and 22 ('In terms of health, it is better to stop smoking even if this results in weight gain') were removed from the item pool on the basis that they were likely to be measuring smoking- as well as obesity-related knowledge and would, therefore, be multidimensional. In addition, as pointed out in the expert feedback (Section 4.3.5), 'smoking' would need to be quantified in order to accurately compare risk which would increase the items' complexity. Items 3 ('The medical recommendation is that obese people should lose weight slowly, around 1-2lbs (½-1kg) a week'), 9 ('Rapid weight loss in obese people is not associated with any health problems') and 20 ('It is healthier to be obese and keep the same weight than frequently gaining and losing weight ('yo-yoing' in weight)') were also removed as it was felt that they did not, on reflection, truly encapsulate knowledge regarding the health risks associated with obesity, despite endorsement by the majority of experts consulted (see Section 4.3.5). In addition, items 1, 18, 20 and 22 where among the items least well supported by the evidence base (Appendix One).

4.4.3.3.2 Stage 2: Item Discrimination

Among the remaining 20 items, the p-values of items 2 ('Obesity increases the risk of developing diabetes in later life'), 15 ('Obesity does not increase the risk of developing high blood pressure'), 16 ('Obesity increases the risk of having a heart attack (a myocardial infarction)') and 26 ('Avoiding obesity throughout adult life reduces a person's risk of developing heart disease') exceeded the 0.9 cut-off (0.95, 0.94, 0.97 and 0.93, respectively). However, item 15 was retained in the analysis on the basis that this was the only item assessing high blood pressure which was considered a key co-morbidity by the criteria set out in Section 4.3.2.

Item 23 ('In terms of health, it is better for a person to have an 'apple' shape rather than a 'pear' shape') was also removed as, although three items assessing the impact of regional adiposity were included in the item pool, it was with the intention that the least appropriate would be removed.

4.4.3.3.3 Stage 3: True / False Balance

Among the remaining 16 items, the correct response for 6 was 'True' and 'False' for 10 items. To ensure that the resultant scale was balanced, four of the least discriminating items relating obesity to health conditions with no connection to excess adiposity were removed from the item pool; item 7 ('Obesity increases the risk of migraines'), 13 ('Gradual weight gain throughout adult life increases the risk of developing TB (tuberculosis)', 21 ('Obesity increases the risk of developing hay fever') and 24 ('Obesity does not increase the risk of lung cancer'). The removal of items 7, 21 and particularly 13 was supported by the results of the expert feedback presented in Section 4.3.5.

4.3.3.3.4 Stage 4: Item Homogeneity

The remaining 12 items produced a Cronbach's Alpha Coefficient of 0.67 (Table 4.3). Two further items, item 14 ('Gradual weight gain throughout adult life increases the risk of heart disease') and item 19 ('Obesity increases the risk of developing 'flu (influenza)'), were then removed on the basis that it produced a shorter scale while maintaining the balance between items with 'True' and 'False' as the correct responses and without adversely affecting the scale's internal consistency or the scope of the scale in terms of co-morbidities dealt with (Table 4.3). No further deletions could maintain internal consistency, balance and scope and so these 10 items became the Obesity Risk Knowledge Scale (ORKS-10).

4.4.3.4 Obesity Risk Knowledge (ORKS-10) Scale Score Distributions

Respondents' scores for the 10 items selected for the Obesity Risk Knowledge Scale (ORKS-10) displayed a negatively skewed, non-Gaussian distribution (One-Sample Kolmogorov-Smirnov Test ($p < 0.001$)) and ranged from 1 to 10 (mean = 5.25; standard deviation = 2.25; median = 5.0; interquartile range = 3.0) (Figure 4.1).

Figure 4.1 Study Two: Obesity Risk Knowledge Scale Score Distribution

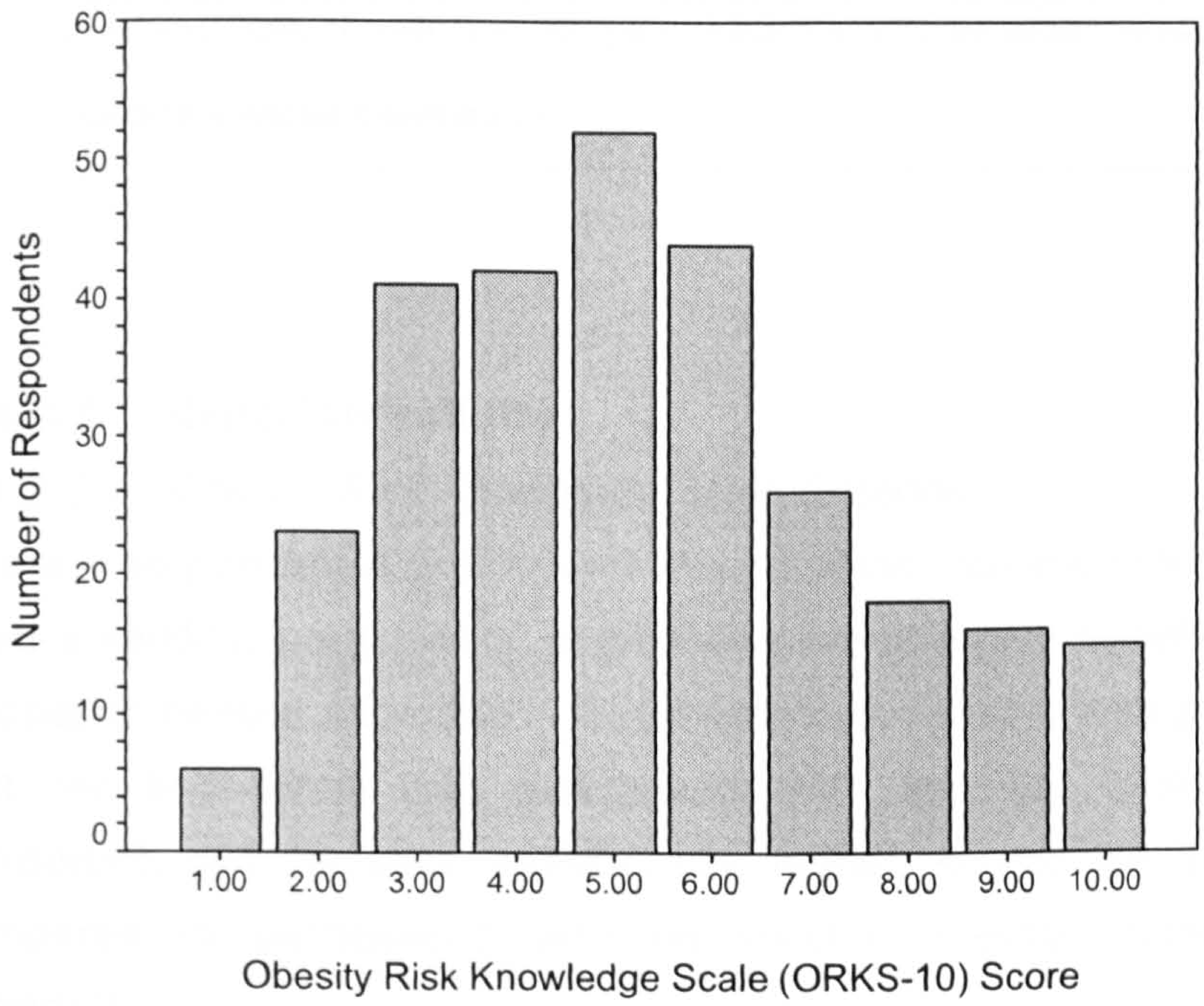


Table 4.3 Obesity Risk Knowledge Scale Item Homogeneity

			Alpha if deleted	
		Correct response	**12 item pool**	**10 item scale**
4	Obese people can expect to live as long as non-obese people.	F	0.68	0.69
5	Obesity increases the risk of developing breast cancer after the menopause.	T	0.65	0.65
6	There is **no** significant health benefit if an obese person who has developed diabetes in later life, loses weight.	F	0.66	0.66
8	It is better for a person's health to have fat around the hips and thighs than around the stomach and waist.	T	0.67	0.68
10	Obesity increases the risk of developing a food allergy.	F	0.66	0.68
11	A person with a 'beer-belly' shaped stomach has an increased risk of developing diabetes in later life.	F	0.65	0.65
12	Obesity increases the risk of developing bowel cancer.	T	0.67	0.67
14	Gradual weight gain throughout adult life increases the risk of heart disease.	T	0.69	-
15	Obesity does **not** increase the risk of developing high blood pressure.	F	0.68	0.69
17	Obesity is more of a risk to health for people of South Asian (e.g. Indian and Pakistani) descent than people of European descent.	T	0.65	0.65
19	Obesity increases the risk of developing 'flu (influenza).	F	0.69	-
25	An obese person who has developed diabetes late in life would need to lose at least 40% of their body weight to have a significant health benefit.	F	0.65	0.66
	Cronbach's Alpha Coefficient =		**0.69**	**0.69**

4.4.3.5 Criterion Validity

4.4.3.5.1 Obesity Risk Knowledge Scale Criterion

In order to perform a preliminary investigation into the Obesity Risk Knowledge Scale's validity, participants' responses were analysed in reference to a criterion - 'obesity-related expertise'. A dichotomous variable was produced in order to test the hypothesis that participants with specific obesity-related expertise ('experts'), will achieve significantly higher scores on the ORKS-10 scale compared to participants with no specific obesity-related expertise ('non-experts').

Participants recruited from John Lewis Nottingham were considered to be 'non-experts' as, although employees may deal with some health-related products, these are not offered in any therapeutic sense and staff members receive no health-related training. First year medical students were also considered to be 'non-experts' as, although they were studying a health-related degree, this had only been for 4 months and had not received any information on obesity. Second year nutrition students, however, had received lectures on obesity and were, therefore, considered to be 'experts' along with others who should also be aware of the consequences of obesity i.e. committee members of the Association for the Study of Obesity, delegates attending a conference dealing with aspects of nutrition including obesity and academic staff in relevant health-related disciplines at the University of Nottingham.

In order to conduct multiple regression analysis, several other ordinal or categorical variables were also treated as dichotomous variables. Social class were coded as 'Blue Collar occupations' (social class 3 'routine and manual occupations') and 'White Collar occupations (social class 1 'managerial and professional occupations', social class 2 'intermediate occupations' and full-time higher education students), education level as 'no higher qualification' (left school before exams or attained a GCSE qualification or equivalent) and 'higher qualifications' (attained an A-level, A-level equivalent or more advanced qualification), and ethnicity as 'White European' and 'Non-White European'. Martial status was not considered as a dependent variable in the multiple regression analyses due to the incomplete data collection.

4.4.3.5.2 Data Screening

The data set of all 283 responses was screened using SPSS Missing Value Analysis for missing values on three continuous variables (age, Body Mass Index and ORKS-10 scale score) and five dichotomous variables (sex, social class, education level, ethnicity and obesity-related expertise). As no item was missing more than seven values (2.5%), t-tests and Chi-squares were not requested to investigate whether the missing values were related to any other variable. Eighteen cases with missing values were deleted from the data set resulting in a sample size of 265. In addition, two cases were excluded as they were considered to represent significant univariate outliers by producing standardized scores on Body Mass Index in excess of 3.29 ($p < 0.001$, two-tailed test). One further case displayed a Mahalanobis distance greater than $\chi^2(7) = 24.322$ ($p < 0.001$) and was also deleted. A subsequent analysis revealed no further cases displayed a Mahalanobis distance greater than 24.322.

4.4.3.5.3 Between Group Differences

Of the remaining 262 participants, 204 were classified as 'non-experts' and 58 were classified as 'experts'. It was estimated that the sample sizes obtained would be sufficient to detect a difference of 1.2 points between the groups on the ORKS-10 scale ($p < 0.05$, $\beta = 0.95$).

Both expert and non-expert ORKS-10 scale scores displayed a non-Gaussian distribution (Figure 4.2). The expert group achieved considerably higher scores than the non-expert group (median 8.0 vs. 4.0), and this difference was highly significant ($Z = -9.89$; $p < 0.001$) (Table 4.4).

While there was no significant difference between the expert and non-expert groups in terms of sex, ethnicity or self-reported Body Mass Index, there was a highly significant difference in terms of education level ($\chi^2_{(1)} = 23.11$; $p < 0.001$), socio-economic status ($\chi^2_{(1)} = 16.67$; $p < 0.001$) and age ($Z = -5.28$; $p < 0.001$) (Table 4.4).

Figure 4.2 Study Two: Samples' ORKS-10 Scale Score Distributions

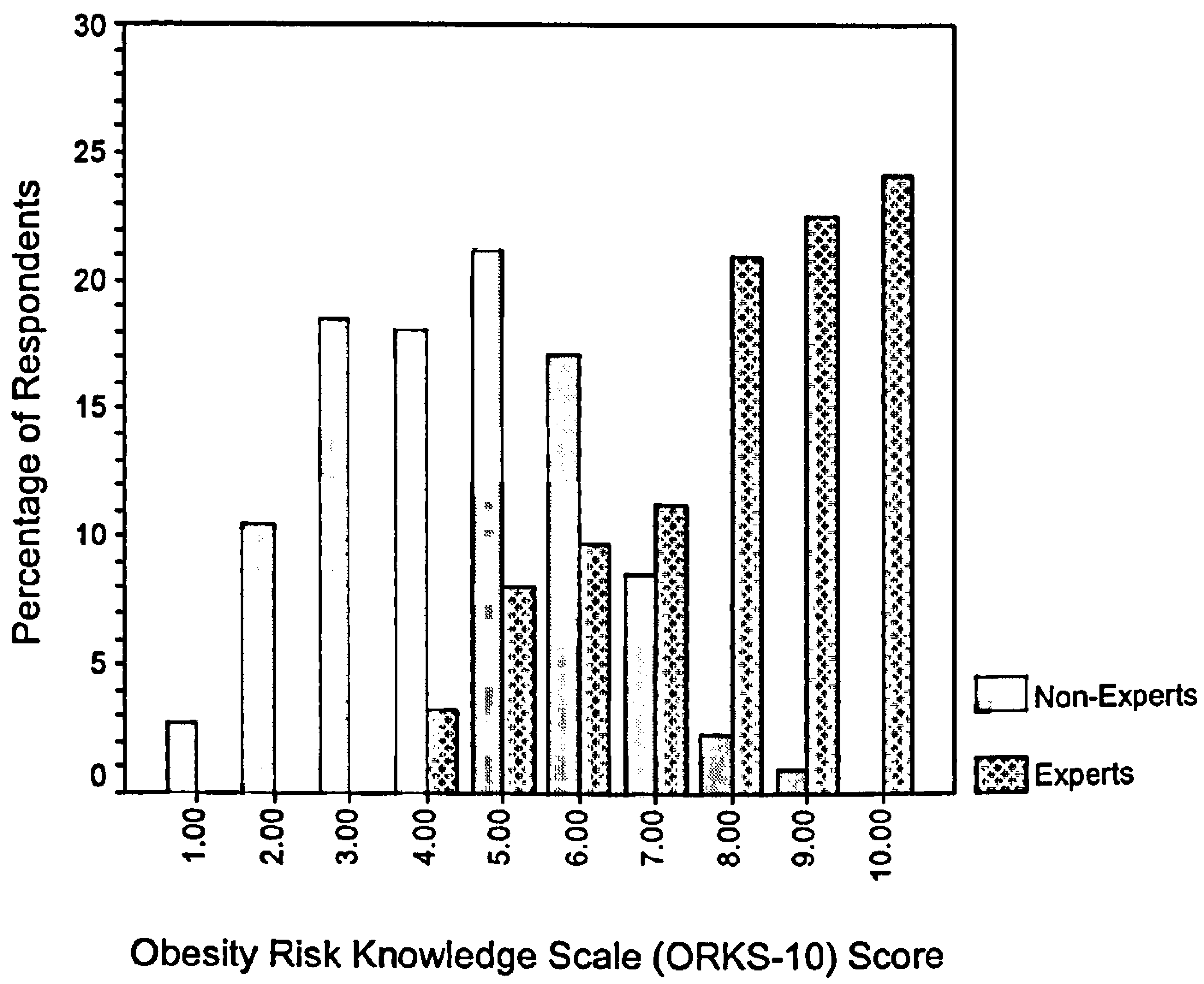


Table 4.4 Study Two: ORKS-10 Scale Score Between Group Differences

	Non-Expert Group	**Expert Group**	**Statistical difference**
N	204	58	
ORKS-10 Scale Score			
Range	1 - 9	4 - 10	
Mean (Standard Deviation)	4.45 (1.71)	8.12 (1.71)	Z = -9.89; $p < 0.001$
Median (IQR)*	4.0 (3.0)	8.0 (3.0)	
Self Reported BMI (kg/m²)			
Range	16.71 – 35.08	17.81 – 32.19	
Mean (Standard Deviation)	22.87 (3.44)	22.99 (2.61)	NS
Median (IQR)	22.27 (4.07)	-	
Age in years			
Range	16.91 – 59.70	19.73 – 58.51	
Mean (Standard Deviation)	29.23 (12.66)	37.86 (11.62)	Z = -5.28; $p < 0.001$
Median (IQR)	20.22 (20.65)	-	
Gender (%)			
Male	60 (29.4)	18 (31.0)	NS
Female	144 (70.6)	40 (69.0)	
Ethnicity (%)			
Non-White European	25 (12.3)	3 (5.2)	NS
White European	179 (87.7)	55 (94.8)	
Education Level (%)			
No Higher Education	73 (35.8)	2 (3.4)	$\chi^2_{(1)} = 23.11$; $p < 0.001$
Higher Education	131 (64.2)	56 (96.6)	
Social class (%)			
Blue Collar	54 (26.5)	1 (1.7)	$\chi^2_{(1)} = 16.67$; $p < 0.001$
White Collar	150 (73.5)	57 (98.3)	

* *Median and Inter-quartile Ranges (IQR) given for variables with Non-Gaussian distributions only.*

4.4.3.5.4 Multivariate Analyses

Standard Linear Regression Analysis

Potentially confounding factors were identified using a standard linear regression analysis in which ORKS-10 scale scores were entered as the dependent variable with age, self-reported Body Mass Index, gender, ethnicity, expertise, social class and education level entered as independent variables. A sample size of 262 comfortably exceeds the requirement of a minimum of 10 cases per variable [206]. The partial regression coefficients were statistically significant for age ($B = 0.037$, $t_{255} = 3.289$, $p < 0.05$) and expertise ($B = 3.314$, $t_{255} = 10.89$, $p < 0.001$) only. Age was, therefore, considered to be a potential confounding variable. Due to the potential for auto-collinearity between social class and education level, and the significant differences in these variables between the expert and non-expert groups, education level was also retained as a potential confounder. Self-reported Body Mass Index, gender, ethnicity and social class were, therefore, excluded from the subsequent hierarchical analyses to determine the proportion of variance explained by expertise.

Hierarchical Multiple Regression Analysis

The hierarchical multiple regression analysis using ORKS-10 scale scores as the dependent variable with education level and age entered as independent variables in step 1 followed by expertise in step 2, revealed that age and education level explained 24.5% of the variance in scores (Table 4.5), with education level explaining a higher proportion of the variance than age (standardised $\beta = 0.548$ and 0.370, respectively). The partial regression coefficients were statistically significant for both variables; education level ($B = 1.871$, $t_{260} = 6.031$, $p < 0.001$) and age ($B = 0.097$, $t_{260} = 8.930$, $p < 0.001$). When entered in step 2, expertise explained a further 23.9% of the variance (Table 4.5). Higher scores on the ORKS-10 scale were associated with being older, having attained a higher educational qualification and being an expert.

Table 4.5 Study Two: ORKS-10 Scale Score Predictive Variables*

Step	Predictors	R^2	Adjusted R^2	R^2 change	F	df_1	df_2	p
1	Education Level, Age	0.245	0.239	0.245	41.939	2	259	<0.001
2	Expertise	0.483	0.477	0.239	80.441	1	258	<0.001

**Hierarchical multiple regression; ORKS-10 scale scores as dependent variable; age and education level requested to enter as independent variables at step one, expertise requested to enter at step 2.*

Hierarchical Multiple Regression Analysis – Higher Education Subset

An additional hierarchical multiple regression analysis was performed on the subset of data from participants who indicated that they had attained a higher educational qualification (n = 187) using ORKS-10 scale scores as the dependent variable with age entered as the first independent variable followed by expertise in step 2. Age significantly predicted scale scores, explaining 32.0% of the variance ($F_{1,185} = 87.076$, $p < 0.001$) while expertise accounted for a further 24.7% ($F_{1,184} = 104.668$, $p < 0.001$). Once again, higher scores on the ORKS-10 scale were associated with being older and being an expert.

4.4.3.6 ORKS-10 Scale Readability

The items included in the ORKS-10 scale were written in language suitable for individuals aged 15 years and above (Flesch-Kincaid Reading Grade [82] of 10.0; UK equivalent = Year 11). Omitting the term 'obesity' from the analysis produces a Flesch-Kincaid Grade Level of 9.3.

4.4.4 STUDY TWO DISCUSSION

4.4.4.1 ORKS-10 Scale Psychometric Properties

The 'Maximization of Internal Consistency'-type item analysis used in this study, ensured that the resultant ORKS-10 scale proved to be a short yet reliable measure of obesity risk knowledge with a level of internal consistency for the total scale which conforms to the accepted minimum of a Cronbach's Alpha ≥ 0.7 described by Kline [78]. This result is particularly significant considering that the scale measures a broad area of knowledge with relatively few items; factors which are known to reduce internal consistency [78].

Although the 10 item Obesity Risk Knowledge Scale covers a wide range of issues, health in relation to regional adiposity and ethnicity, longevity, cancer, cardiovascular disease, and type II diabetes mellitus, it cannot possibly cover every aspect of knowledge regarding obesity as a health risk. Due to the test construction procedures undertaken, they do, however, offer a small yet representative sample of items from which inferences can be made about all possible item responses [54]. The majority of the items' content validity was confirmed by five of the seven experts consulted.

Within the non-expert group, the ORKS-10 scale produces a good spread of scores with no obvious ceiling or floor effects. As predicted, scores of the expert group produce a ceiling effect, but the spread of scores suggests that even in this highly knowledgeable group the ORKS-10 scale still discriminates between individuals.

Although the ORKS-10 scale has proved to have face and content validity, it is also important to establish the validity of a scale empirically, for example by comparing the scores obtained with an independent measure of the same variable [54]. Univariate analysis indicates that 'experts' scored on average 4 points higher than 'non-experts', demonstrating a meaningful difference in attainment. The standard multiple regression analysis, however, identifies age and education level as potentially confounding factors.

Although the hierarchical multiple regression analysis with age and education level entered in step 1 followed by expertise in step 2 rigorously controls for these potentially confounding factors by taking into account any overlapping variance, expertise continues to explain an important proportion of the variance in ORKS-10 scale scores. Analysis of the subset of participants with higher education offers a less conservative estimate of the impact of expertise on ORKS-10 scale scores and reveals that, when the effects of age are controlled for, specific obesity-related expertise accounts for a slightly higher proportion of the variance. Although previous research has indicated that cognitive ability is a strong predictor of general health knowledge [207] and that education level is independently associated with general nutrition knowledge [208], these results suggest that the ORKS-10 scale was measuring specific obesity-related knowledge rather than, for example, general scientific knowledge.

Although age was treated as a potentially confounding factor in the hierarchical analysis, it is interesting to observe its ability to predict ORKS-10 scale scores, with higher scores being associated with being older. Age has also been found to be a statistically significant, although minor, predictor of general health knowledge [208]. Significantly higher general nutrition knowledge scores have also been found among individuals aged 35 - 64 years compared to individuals aged 18 – 34 years, although lower scores were recorded among individuals aged 65 and above [207]. As Parmenter and Wardle point out, it is reasonable to assume that factors related to aging, such as increased exposure to health education messages, health experience and increased health salience, would influence health-related knowledge [208]. These results, therefore, also offer some support for the scale's convergent validity.

4.4.4.2 Study Strengths & Limitations

4.4.4.2.1 Recruitment Methods

The majority of questionnaires were distributed and completed without the presence of a researcher, which has the potential to negatively affect the response rate obtained and to increase the opportunity for cheating. The potential for cheating, however, was thought to be minimised by the fact that responses were anonymous, so that a high score would not reflect on the individual in any way.

4.4.4.2.2 Response Rate

The data collection methods employed in producing a reasonable response rate, comparable to psychometric scale development studies such as Parmenter and Wardle's general nutrition knowledge questionnaire [95]. However, it is clear that the majority of individuals approached were not sufficiently motivated to complete the questionnaire. The individuals who do take part are, therefore, a sub-section of the whole population who may differ in particular characteristics, such as health saliency, and have very different levels of knowledge compared with those individuals who did not take part. This could affect the representativeness of the sample and potentially the applicability of the proposed scale. However, as data collection is anonymous, there is no information available regarding the individuals who did not participate, so the extent to which the participants differ from non-participants is unknown.

4.4.4.2.3 Sample Size

As there were very few missing values for any item, these were not considered to represent significant source of bias and so cases with missing data were deleted from the data set [91]. This procedure resulted in the deletion of 18 cases which did not significantly alter the adequacy of the sample size used in the statistical analyses; 283 responses used in the item analysis comfortably exceeds the recommended minimum of 100 cases [78] while the 262 responses used in the multiple regression analyses exceeds the minimum requirement of 10 cases per variable [206] and provided sufficient power for univariate analysis.

4.4.4.2.4 Sample Representativeness

To ensure that the Obesity Risk Knowledge Scale can be used as a generic instrument, it is desirable that the samples used for its development are representative of the UK adult population. Sampling was, however, opportunistic rather than stratified, which has resulted in important differences between the sample obtained and the UK population, particularly in terms of the proportion of students. This is not, however, considered to be important for the establishment of reliability and validity in this study, as the characteristics of respondents are only used in the analysis to control for possible confounding factors. While the relative homogeneity of the samples used, in terms of demographic characteristics, has the advantage of minimising the influence of possible confounding factors, it does reduce the amount of information regarding the scale's performance with other populations, for example the long-term unemployed, adolescents or ethnic minorities.

Although several authors of test construction methodology recommend that scales are developed using separate-sex samples (see Section 2.4.3.3.2), this analysis was carried out on a sample heterogenous for gender. This does not represent a significant limitation of this study however, as the general linear multiple regression analysis reveals that gender does not significantly predict ORKS-10 scale scores.

4.4.4.2.5 Item Analysis

Items were excluded from the item pool if they produced p-values below 0.1 or exceeding 0.9 as opposed to the conventional 0.2 and 0.8 cut-offs. These alternative criteria was selected as several interesting items would otherwise have been lost and even these were over-ridden in order to retain the item 'Obesity does not increase the risk of developing high blood pressure'. Although selecting items that exceeded conventional cut-offs has been used in previous scale development, see Section 2.4.3.2.4, it has the potential to affect the resultant scale's discriminatory ability. However, the multiple regression analyses reveal that the scale produces a good spread of scores and successfully discriminates between expert and non-expert groups.

In addition to items with inadequate psychometric properties, several items were removed due to content considerations and feedback from a panel of experts. Although intuitive criteria is not traditionally part of item analysis, it does take into account that the item pool can only ever represent the test constructor's subjective and, therefore, potentially imperfect attempt at capturing the construct of interest.

4.4.4.2.6 Language & Readability

In general terms, the Obesity Risk Knowledge Scale is written in language suitable for an individual aged 15 or higher. However, the term 'obesity' may artificially augment the reading estimate, as it contains four syllables and is, therefore, considered to be complex even though the condition's media profile could be expected to enhance its true understandability. Removing this term from the analysis does reduce the estimated reading age to 14 years or above, although this remains higher than the minimum recommended reading age of 12 years as described in Section 2.4.2.1.4). It is unfortunate that the most complex items seem to have been selected from the original item pool, which had a slightly lower overall reading age, as this limits the extent to which the scale can be used in a population as diverse as the UK population.

Although one respondent from the expert panel suggested that the term 'type II diabetes' should be used in items 6 and 25, this would add an unacceptable level of complexity. In order to avoid medical terminology, the term suggested by the consultant dietician, 'diabetes in later life', was retained.

The terms 'diabetes in later life' (items 6 and 25) and 'breast cancer after the menopause' (item 5) specify the conditions under which the obesity – health condition relationship should be considered. This is extremely important, as responses to items that fail to make these distinctions are essentially measuring two conflicting aspects of knowledge, which has the potential to introduce measurement error; while obesity is considered to be a risk factor for type II diabetes mellitus, it is not for type I diabetes mellitus and, equally, obesity is considered to be risk factor for breast cancer in post-menopausal women, but not in pre-menopausal women.

Another important feature of ORKS-10 scale items is that the term 'obesity' rather than 'overweight' is consistently used, unlike the subscales assessing knowledge regarding the health effects of 'obesity' developed by McArthur, Pena and Holbert [162] and Banasiak and Murr [164]. Once again, this lends specificity to the resultant scale, as overweight defined by the World Health Organization (25.0 – 29.9 kg/m^2) has a different relationship to certain health conditions than obesity ($\geq$ 30 kg/m^2) [5].

One expert from the content validity panel commented that item 25 contained a percentage which s/he believed "...detracts from the important issues." However, Foster *et al.* have developed and successfully used a similar unstructured item, 'A 10% reduction in body weight is sufficient to significantly improve obesity-related health complications', although this was with a sample of US primary care physicians who are perhaps more familiar with the use of percentages [120]. The use of percentages has also been criticised when communicating probabilistic information to the general public [209], which raises the concern that participants who understand percentages may be more likely to answer this item correctly and obtain higher ORKS-10 scale scores. Scores on this item were, however, sufficiently correlated with one another (Table 4.3) to imply that this was not the case. It was also considered to be extremely important that the amount of weight loss was quantified in order for the item response to be considered accurate or inaccurate. This item also importantly represents a positively worded item for which 'false' is considered to be the correct answer.

Item 11 was criticised by one expert for not specifying who the 'person with a 'beer-belly' shaped stomach' should be compared to. This is a valid point in that the use of different comparators has the potential to introduce error. It was, however, felt that the comparators would likely all equate to 'compared to a person without a 'beer-belly' shaped stomach' and that specifying this item would significantly increase its complexity.

Item 8 'It is better for a person's health to have fat around the hips and thighs than around the stomach and waist' was criticised by two experts from the panel for being a 'negative question' and for not specifying 'extra' or 'excess' fat. As this item is positively worded and 'true' is considered to be the correct answer, it is unclear how to interpret the first criticism. While it is true that extra specificity may help to reduce the item's measurement error, the term 'fat' was purposefully used as a simple lay expression of excess adiposity.

4.4.4.2.7 Response Accuracy & Scoring

Item responses are considered to be correct or incorrect on the basis of a selection of consensus statements and primary evidence presented in Appendix One. It is, however, important that knowledge scores are considered using evidence available at the time of data collection. If new evidence becomes available which alters whether an item is considered to be true or false, the accuracy of a participant's response needs to be assessed in terms of what was 'true' at the time, as well as what is 'true' now. Although no new evidence has emerged since the development of the ORKS-10 scale which alters the decisions regarding the accuracy of responses, the need to constantly review the evidence-base upon which judgements of accuracy are made, is demonstrated by the emergence of new evidence regarding the impact of overweight (BMI 25 to <30 kg/m^2) on mortality [210].

It is also worth discussing the scoring system in which 'uncertain' responses were given the equivalent score as an incorrect response. Although previous research has scored the 'uncertain' in such a way that it indicates slightly higher levels of knowledge than an incorrect response, but not as high as a correct response (e.g. [162]), which conflicts with the concept of knowledge as an absolute as discussed in Section 2.2. In this scale, an 'uncertain' response is considered to represent an absence of accurate knowledge and, therefore, scores represent levels of accurate knowledge.

4.4.4.2.8 Criterion Validity

While these analyses offer some support for the ORKS-10's criterion validity and justify further pilot work, it is important to recognise several limitations. Empirical validity should be established using data from a sample independent to the one used to develop the scale, while the non-expert sample's representativeness is confounded by the large proportion of students.

It is also important to recognise the essentially subjective criteria used as the independent measure of obesity-related knowledge. Participants were categorised as 'experts' or 'non-experts' on the basis of attributes known about the group to which they belonged, for example first year medical students were known to have not received any information on obesity during the course of their studies. Group membership, however, does not guarantee a particular level of expertise, for example a diligent first year medical student may have read texts on obesity in addition to the recommended reading and so their true level of expertise would be underestimated. In addition, exposure to information does not necessarily correlate with knowledge retention, for example a disaffected nutrition student may have slept throughout their obesity lecture and not read any of the recommended texts, resulting in their true level of expertise being overestimated. However, the potential for under- and over-estimation is applicable to all participants suggesting that any error would be random rather than systematic. As discussed in Section 2.4.5.3, there is no 'gold-standard' measure of abstract concepts such as obesity-related knowledge that can be used as an alternative criteria.

4.4.5 STUDY TWO CONCLUSION

This study has produced a short scale with which to assess knowledge regarding the effects of obesity on health, suitable for individuals aged 14 and over. Although these initial data suggests that the Obesity Risk Knowledge Scale is reliable, discriminant and valid, further data from a new, more diverse sample is required to confirm this.

4.5 STUDY THREE: CONFIRMATION OF PSYCHOMETRIC PROPERTIES

4.5.1 STUDY THREE AIM

To confirm the Obesity Risk Knowledge Scale's reliability and criterion validity in a more diverse sample.

4.5.2 STUDY THREE METHOD

4.5.2.1 Study Design

A cross-sectional survey.

4.5.2.2 Sampling

4.5.2.2.1 Sample A

An opportunistic sample of staff at John Lewis Solihull attending their weekly Communications Meeting on Tuesday 11th May 2004 was invited to participate. John Lewis Solihull is one of 26 department stores owned by The John Lewis Partnership and is located in the West Midlands. The store has a full-time Occupational Health Advisor responsible for a wide range of staff health and safety issues.

4.5.2.2.2 Sample B

An opportunistic sample of staff at DHL Aviation (UK) Ltd based at Nottingham East Midlands and London Heathrow Airports was invited to participate. DHL Aviation (UK) Ltd provide air freight services to businesses and is part of a worldwide DHL network offering express, air and ocean freight, overland transport and logistics solutions. The two sites were covered by full-time Occupational Health Advisor responsible for a wide range of staff health and safety issues.

4.5.2.2.3 Sample C

An opportunistic sample of delegates attending a Trent Workforce Confederation conference entitled 'The Obesity Epidemic' held on Thursday 4th March 2004 was invited to participate.

4.5.2.2.4 Sample D

An opportunistic sample of members of the Association for the Study of Obesity, who provided an email contact address upon registration, was invited to participate. The Association for the Study of Obesity's key objectives are to promote professional awareness of obesity and its impact on health, to educate and disseminate recent research on the causes, consequences, treatment, and prevention of obesity and to prioritise obesity and provide opinion leadership in the UK.

4.5.2.3 Measures

4.5.2.3.1 Modified Obesity Risk Knowledge Scale

The Obesity Risk Knowledge Scale (ORKS-10) represents a 10-item scale measuring knowledge regarding the health risks associated with obesity, developed in the initial scale development conducted in Study Two. Several items were, however, slightly re-worded subsequently to Study Two, so as to improve the scale's readability from a Flesch-Kincaid Reading Grade of 10.0 (15 years and above) to 8.4 (13 years and above) (14 years plus to 12 years plus with 'obesity' omitted) without changing the items' content (Table 4.6).

To ensure that these changes did not significantly influence the scores achieved, a convenience sample of first year medical students completed one of two versions of the ORKS-10 scale; the original item wording used in Study Two (version 1) or the modified wording proposed for Study Three (version 2). Ninety-two students completed a questionnaire during a Behavioural Sciences in Medicine Problem-Based Learning Seminar on Thursday, 25th November 2004. None of the participants had received any obesity-related information during the course of their studies or had completed the ORKS-10 scale previously. It was estimated that the sample sizes obtained (version 1 = 50, version 2 = 42) would be sufficient to detect a difference of 1.2 points between the groups on the ORKS-10 scale ($p < 0.05$, $\beta = 0.95$). Participants completing version 1 scored on average 5.01 points (standard deviation = 1.43; median = 5.0; interquartile range = 2.0) while participants who completed version 2 scored on average 5.14 points (standard deviation = 1.62; median = 5.0; interquartile range = 2.0); a non-significant difference ($Z = -0.418$, $p > 0.05$). There were no significant differences between the samples in terms of age, gender, ethnicity, or self-reported Body Mass Index and so sociodemographic differences were not considered to have been potentially confounding factors.

Table 4.6 ORKS-10 Items used in Study Two & Study Three

Study Two Items (Version 1)			Study Three Items (Version 2)	
11	A person with a 'beer-belly' shaped stomach has an increased risk of developing diabetes in later life.	*becomes*	1	A person with a 'beer-belly' shaped stomach has an increased risk of getting diabetes.
12	Obesity increases the risk of developing bowel cancer.	*becomes*	2	Obesity increases the risk of getting bowel cancer.
25	An obese person who has developed diabetes late in life would need to lose at least 40% of their body weight to have a significant health benefit.	*becomes*	3	An obese person who gets diabetes needs to lose at least 40% of their body weight for clear health benefits.
4	Obese people can expect to live as long as non-obese people.	*becomes*	4	Obese people can expect to live as long as non-obese people.
5	Obesity increases the risk of developing breast cancer after the menopause.	*becomes*	5	Obesity increases the risk of getting breast cancer after the menopause.
17	Obesity is more of a risk to health for people of South Asian (e.g. Indian and Pakistani) descent than people of European descent.	*becomes*	6	Obesity is more of a risk to health for people from South Asia (e.g. India and Pakistan) than it is for White Europeans.
6	There is **no** significant health benefit if an obese person who has developed diabetes in later life, loses weight.	*becomes*	7	There is **no** major health benefit if an obese person who gets diabetes, loses weight.
15	Obesity does **not** increase the risk of developing high blood pressure.	*becomes*	8	Obesity does **not** increase the risk of developing high blood pressure.
8	It is better for a person's health to have fat around the hips and thighs than around the stomach and waist.	*becomes*	9	It is better for a person's health to have fat around the hips and thighs than around the stomach and waist.
10	Obesity increases the risk of developing a food allergy.	*becomes*	10	Obesity increases the risk of getting a food allergy.

4.5.2.3.2 Sociodemographic Characteristics

A questionnaire was used to obtain details of age, gender, marital status, ethnicity and level of education. Occupation was obtained using a free response question and status coded using the National Statistics Socio-economic Classification (NS-SEC) [205]. Respondents were also asked to record their current height and weight from which self-reported Body Mass Index (kg/m^2) was calculated.

4.5.2.3.3 Questionnaire Format

Participants in Sample A, B and C completed a traditional 'pen-and-paper' version, while the participants in Sample D completed an 'on-line' version (Appendix Four). The item wording and order on the two versions were, however, identical while the questionnaire lay-out and instructions for completion were comparable.

4.5.2.4 Procedures

4.5.2.4.1 Data Collection

Sample A:

One week prior to the distribution of the questionnaires, posters were displayed on the Occupational Health pin-boards promoting the study. Department Managers received fact-sheets and oral explanations of the study by the in-house Occupational Health Advisor and were then requested to distribute questionnaires to every member of staff attending their weekly Communications Meeting on Tuesday 11th May 2004. Staff received a verbal reminder and were thanked for their participation by Departmental Managers at the following week's Communications Meeting. Any questionnaires that were not distributed to staff were returned to the in-house Occupational Health Advisor. All questionnaires were accompanied by a covering letter/information sheet and a freepost envelope in which participants were invited to return their responses. All responses were anonymous and no incentive was provided.

Sample B:

Questionnaires, accompanied by a covering letter/information sheet and a freepost envelope were distributed along with the staff's monthly pay-slip on Tuesday 25th May 2004. No reminder was given and undeliverable questionnaires were not monitored. All responses were anonymous and no incentive was provided.

Sample C:
Questionnaires, accompanied by a covering letter/information sheet and a freepost envelope, were mailed to each delegate on Monday, 15th March 2004. A letter thanking participants and reminding non-responders to complete and return their questionnaire, along with a copy of the questionnaire and a freepost envelope, was mailed on Tuesday, 30th March 2004. All responses were anonymous and no incentive was provided.

Sample D:
Every member of the Association for the Study of Obesity who had provided an email address with their registration details was sent an email on Thursday, 9th September 2004 explaining the study and inviting them to follow a URL link to a web-site. Participants were then required to enter the password provided and complete the questionnaire. Responses were submitted to the web-site and down-loaded into an Excel spread-sheet. Undeliverable messages were monitored and a reminder and notification of site closure sent out on Monday, 20th September 2004 and Thursday, 14th October 2004, respectively. The site was closed on Friday, 29th October 2004. All responses were anonymous and no incentive was provided.

4.5.2.4.2 Data Analysis

All data analyses were conducted using SPSS (Version 11.5). The ORKS-10 scale was assessed in terms of internal consistency using Cronbach's Alpha Coefficient as outlined to determine whether it continued to represent a reliable scale. Univariate statistics were used to investigate between group differences while the ORKS-10's criterion validity was investigated using multiple regression analysis with ORKS-10 scale scores as the dependent variable and sociodemographic variables as independent variables.

4.5.2.4.3 Obesity Risk Knowledge Scale Criterion

As in Study Two, participants' responses were analysed in reference to a criterion – 'obesity-related expertise'. This time an ordinal variable was produced; 'high', 'moderate' and 'low' levels of obesity-related expertise.

Participants recruited from John Lewis Solihull and DHL Aviation (UK) Ltd were considered to have 'low' levels of obesity-related expertise as, although employees may deal with some health-related products, these are not offered in any therapeutic sense and staff members receive no health-related training. Conference delegates were considered to have 'moderate' levels of obesity-related expertise as they were largely medical professionals from non-obesity-related disciplines taking part in Continuing Professional Development. Members of the Association for the Study of Obesity were considered to have 'high' levels of obesity-related expertise due to their special interest and the work of the organisation.

4.5.2.5 Ethical Considerations

This study received approval from the Nottingham University Medical School Ethics Committee (Appendix Three). Participants were considered to have consented to taking part in the study if they completed and returned a questionnaire. All responses were anonymous.

4.5.3 STUDY THREE RESULTS

4.5.3.1 Response Rates

Of the 1889 individuals invited to participate in this study, 682 responses were received in total, resulting in a response rate of 36.1% (Table 4.7).

Table 4.7 Study Three: Response Rates

	Questionnaires Distributed *n*	Responses Received *n*	Response Rate
Sample A: Staff members, John Lewis Solihull	479	186	38.8%
Sample B: Staff members, DHL Aviation (UK) Ltd	900	134	14.9%
Sample C: Conference delegates	87	82	94.3%
Sample D: Association for the Study of Obesity members	473	265	56.0%
Total Sample	1889	682	36.1%

4.5.3.2 Data Screening

4.5.3.2.1 Literacy

Returned responses were excluded from the analysis if the respondents had indicated that they had trouble reading English (n = 13).

4.5.3.2.2 Missing Values

The 669 responses received from participants who indicated that they had no trouble reading English, was screened using SPSS Missing Value Analysis for missing values on three continuous variables (age, Body Mass Index and ORKS-10 scale score) and six dichotomous variables (sex, social class, education level, ethnicity, obesity-related expertise, and martial status). The only variable with more than 5% missing values was social class (n = 88, 13.2%). T-tests and Chi-squares revealed that missingness on social class was not systematically associated with any other variable except expertise. Participants with 'moderate' levels of expertise were significantly less likely to have missing data on social class than either those with 'low' ($\chi^2_{(1)} = 9.48$; $p < 0.05$) or 'high' levels of expertise' ($\chi^2_{(1)} = 14.18$; $p < 0.001$), although there was no significant difference between those with 'low' or 'high' levels of expertise. All cases with missing data were, therefore, deleted and the establishment of criterion validity using multiple regression analysis involved those with 'low' and 'high' levels of obesity-related expertise only.

4.5.3.2.3 Univariate & Multivariate Outliers

Of the five dichotomous variables, only ethnicity exceeded the maximum recommended 90%:10% split (90.6%:9.0%) and was removed from subsequent multivariate analysis. Therefore, only the 148 cases with missing values on the eight remaining variables (age, Body Mass Index, ORKS-10 scale scores, sex, social class, education level, obesity-related expertise, martial status) were deleted.

In addition, five cases were excluded as they were considered to represent significant univariate outliers by producing standardized scores on Body Mass Index in excess of 3.29 ($p < 0.001$, two-tailed test). No cases were identified as significant multivariate outliers (Mahalanobis distance > 24.322).

4.5.3.3 Respondents' Characteristics

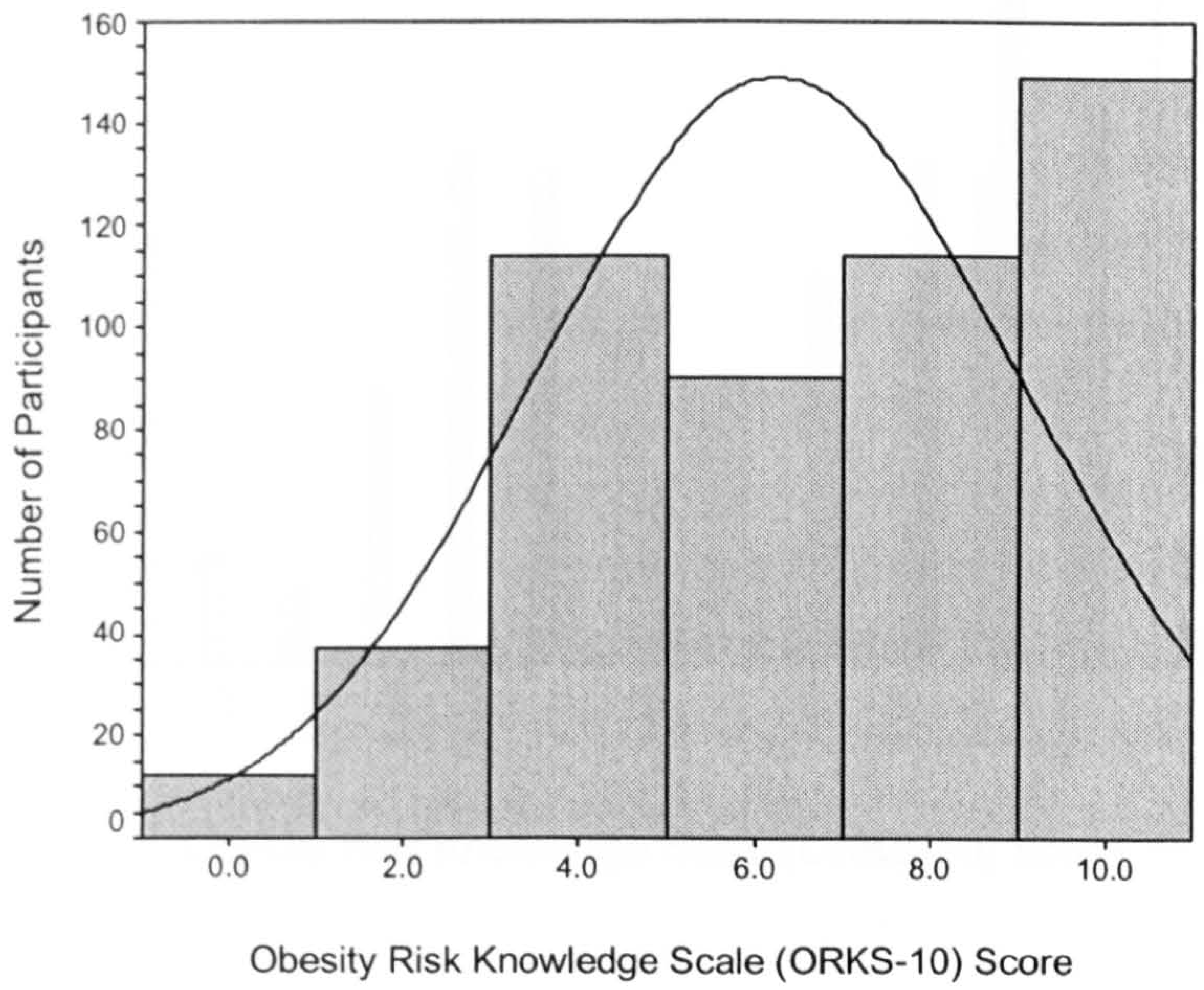
Within the sample of 516 useable responses, participants ranged in age from 16.82 to 66.40 years (mean = 38.84 years, standard deviation = 11.42 years). The majority of this sample were female (n = 360, 69.8%), married / co-habiting (n = 328, 63.6%), White British / European (n = 471, 91.3%) and had received a higher education qualification (n = 392, 76.2%). All three socio-economic classes were represented, with the majority of participants having managerial and professional occupations (n = 339, 65.7%), followed by routine and manual occupations (n = 92, 17.8%) and intermediate occupations (n = 59, 11.4%). In addition there were 26 full-time students (5.0%) who, for the purposes of the following analyses, were coded in terms of the profession for which they were studying. The majority of participants were within the Body Mass Index range of 18.5 – 25 kg/m^2 (n = 329, 63.8%) although a sizeable proportion exceeded the recommended BMI of 25 kg/m^2 (n = 177, 34.3%).

4.5.3.4 ORKS-10 Scale Psychometric Properties

4.5.3.4.1 Score Distribution

Respondents' ORKS-10 scale scores displayed a positively skewed, non-Gaussian distribution (One-Sample Kolmogorov-Smirnov Test ($p < 0.001$)) and ranged from 0 to 10 (mean = 6.26; standard deviation = 2.76; median = 7.0; interquartile range = 5.0) (Figure 4.3).

Figure 4.3 Study Three: Obesity Risk Knowledge Scale Score Distribution



4.5.3.4.2 Internal Consistency & Discrimination Statistics

All 10 items produced a corrected item-total correlation > 0.3 and the Obesity Risk Knowledge Scale (ORKS-10) produced Cronbach's Alpha Coefficient of 0.8. Two items, item 5 and 9, exceeded the 0.9 p-value cut-off, although when those with 'high' levels of obesity-related expertise were excluded from the analysis, the p-values of all 10 items fell within the 0.1 - 0.9 cut-offs.

4.5.3.5 Criterion Validity

4.5.3.5.1 Between Group Differences

Of the 516 participants, 231 individuals were classified as having 'low', 85 as having a 'moderate', and 200 as having 'high' levels of obesity-related expertise. It was estimated that the sample sizes obtained would be sufficient to detect a difference of 1.5 points between the groups ($p < 0.05$, $\beta = 0.95$).

ORKS-10 scale scores from all three samples displayed a positively skewed, non-Gaussian distribution (Figure 4.4). The highest scores were achieved by those with 'high' levels of obesity-related expertise followed by those with 'moderate' levels of obesity-related expertise and 'low' levels of obesity-related expertise (Table 4.8). The differences between the groups were all highly significant ($p < 0.001$) (Table 4.8).

Figure 4.4 Study Three: Samples' ORKS-10 Scale Score Distributions

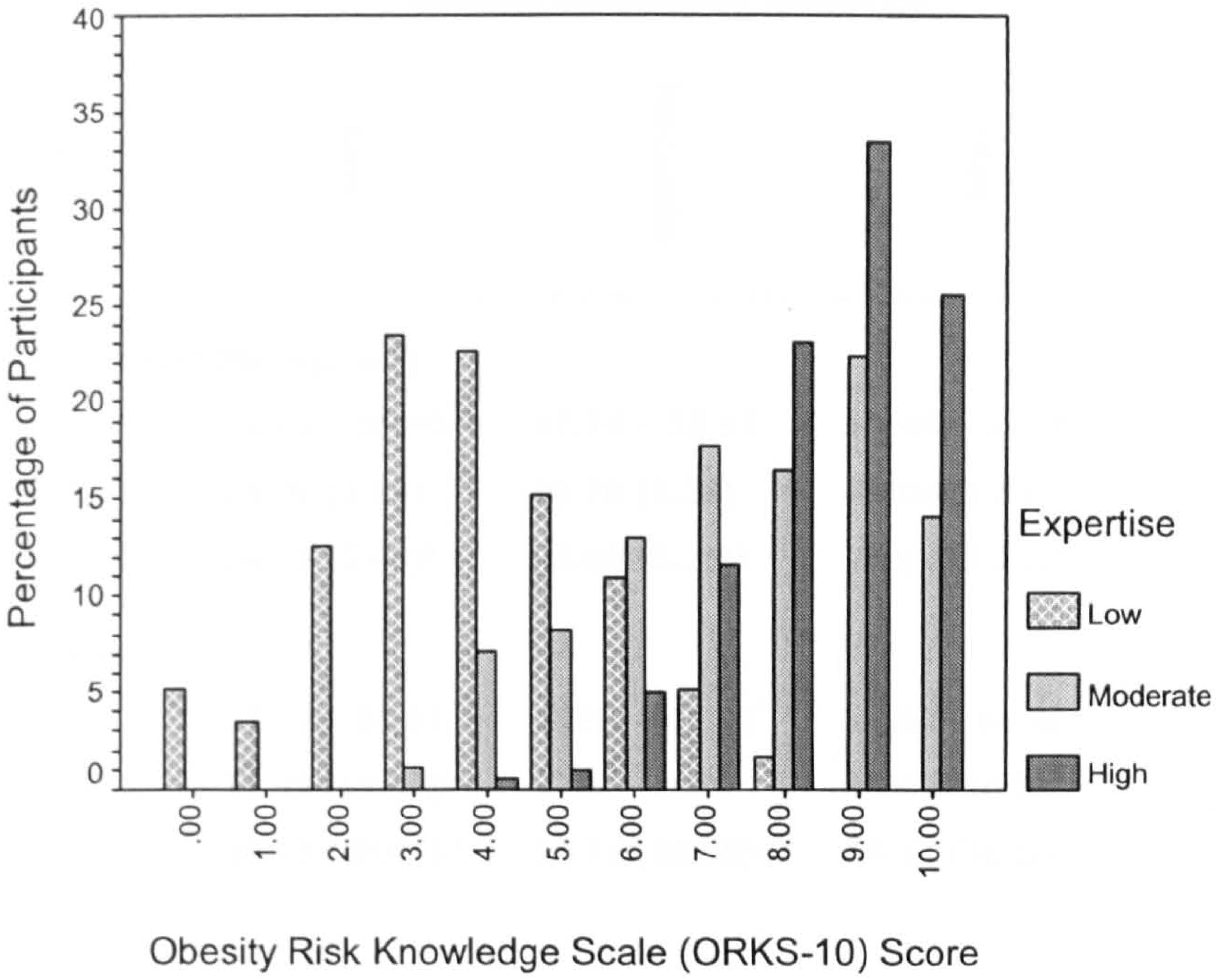


Table 4.8 Study Three: ORKS-10 Scale Score Between Group Differences

		Sample Descriptive Statistics		
Level of obesity-related expertise	**Low**	**Moderate**	**High**	**Statistical difference**
ORKS-10 Score				
Min - Max	0 - 8	3 - 10	4 - 10	
Mean (SD)*	3.80 (1.78)	7.48 (1.85)	8.58 (1.23)	
Median (IQR)+	4.0 (2.0)[a]	8.0 (3.0)[b]	9.0 (2.0)[c]	$\tau = 0.673$; $p < 0.001$
95% Confidence Interval: Lower Bound	3.57	7.48	8.41	
95% Confidence Interval: Upper Bound	4.03	7.88	8.75	

**SD = Standard Deviation*
+IQR = Interquartile Range
[a,b,c]different letters indicate significant differences in post-hoc analysis (P<0.001)

There was also a range of significant differences between the samples in terms of demographic characteristics such as age, Body Mass Index, sex, social class, education level, marital status and ethnicity (Table 4.9).

Table 4.9 Study Three: Sociodemographic Between Group Differences

	Sample Descriptive Statistics			
Level of obesity-related expertise	**Low**	**Moderate**	**High**	**Statistical difference**
Self-Reported BMI (kg/m²)				
Range	16.45 – 36.80	17.74 – 32.12	17.44 – 33.09	
Mean (SD)*	24.98 (3.83)	23.70 (3.33)	23.04 (2.83)	$\tau = -0.188$; $p < 0.001$
Median (IQR)+	24.48 (5.04)[a]	23.40 (5.24)[b]	23.04 (3.71)[b]	
Age in Years				
Range	17.19 – 61.81	16.82 – 63.79	21.67 – 66.40	
Mean (SD)	37.95 (11.90)	37.49 (19.0)	40.45 (10.34)	$\tau = 0.074$; $p < 0.05$
Median (IQR)	36.93 (19.91)[a]	38.71 (18.98)[a,b]	39.74 (16.66)[b]	
Sex (%)				
Male	103 (44.6)	5 (5.9)	48 (24.0)	$Z = -4.899$; $p < 0.001$
Female	128 (55.4)[a]	80 (94.1)[b]	152 (76.0)[c]	
Ethnicity (%)				
Non-White European	16 (6.9)	8 (9.4)	20 (10.0)	NS
White European	215 (93.1)	77 (90.6)	179 (89.5)	
Marital Status (%)				
Not cohabiting	92 (39.8)	37 (43.5)	59 (29.5)	$Z = -2.142$; $p < 0.05$
Cohabiting	139 (60.2)[a]	48 (56.5)[b]	141 (70.5)[b]	
Education Level (%)				
No Higher Education	117 (50.6)	6 (7.1)	0	$Z = -12.479$; $p < 0.001$
Higher Education	114 (49.4)[a]	79 (92.9)[b]	200 (100)[c]	
Social Class (%)				
Blue Collar	91 (39.4)	0	1 (0.5)	$Z = 10.733$; $p < 0.001$
White Collar	140 (60.6)[a]	85 (100)[b]	199 (99.5)[b]	

SD = standard deviation
+*IQR = Interquartile Range*
[a,b,c]*different letters indicate significant differences in post-hoc analysis (P<0.01)*

4.5.3.5.2 Multivariate Analyses

Standard Linear Regression Analysis

Potentially confounding factors were identified using a standard linear regression analysis using data from the samples of participants with 'high' and 'low' levels of obesity-related expertise. ORKS-10 scale scores were entered as the dependent variable with age, self-reported Body Mass Index, gender, marital status, expertise, social class and education level entered as independent variables. The partial regression coefficients were statistically significant for age ($B = 0.028$, $t_{424} = 3.882$, $p < 0.001$) and expertise ($B = 2.253$, $t_{424} = 22.972$, $p < 0.001$) only. Age was, therefore, considered to be a potential confounding variable. Due to the potential for auto-collinearity between social class and education level and the significant differences in these variables between the 'high' and 'low' levels of obesity-related expertise groups, education level was also retained as a potentially confounder. Self-reported Body Mass Index, gender, martial status and social class were, therefore, excluded from the subsequent hierarchical analyses to determine the proportion of variance explained by expertise.

Hierarchical Multiple Regression Analysis

The hierarchical multiple regression analysis using ORKS-10 scale scores as the dependent variable, with education level and age entered as independent variables in step 1, followed by expertise in step 2, revealed that age and education level explained 28.7% of the variance in scores (Table 4.10), with education level explaining a higher proportion of the variance than age (standardised $\beta = 0.500$ and 0.225, respectively). The partial regression coefficients were statistically significant for both variables; education level ($B = 3.200$, $t_{422} = 12.234$, $p < 0.001$) and age ($B = 0.057$, $t_{422} = 5.510$, $p < 0.001$). When entered in step 2, expertise explained a further 42.8% of the variance (Table 4.10). Higher scores on the ORKS-10 scale were associated with being older, having attained a higher educational qualification and having a 'high' level of obesity-related expertise.

Table 4.10 Study Three: ORKS-10 Scale Score Predictive Variables*

Step	Predictors	R^2	Adjusted R^2	R^2 change	F	df_1	df_2	p
1	Education Level, Age	0.287	0.283	0.287	86.066	2	428	<0.001
2	Expertise	0.715	0.713	0.428	346.812	1	427	<0.001

**Hierarchical multiple regression; ORKS-10 scale scores as dependent variable; age and education level requested to enter as independent variables at step one, expertise requested to enter at step 2.*

Hierarchical Multiple Regression Analysis – Higher Education Subset

An additional hierarchical multiple regression analysis was performed on the subset of data from participants who indicated that they had attained a higher educational qualification (n = 313) using ORKS-10 scale scores as the dependent variable, with age entered as the first independent variable followed by expertise in step 2. Age significantly predicted scale scores, explaining 7.3% of the variance ($F_{1,312}$ = 24.429, p< 0.001) while expertise accounted for a further 65.5% ($F_{1,311}$ = 414.455, p< 0.001). Once again, higher scores on the ORKS-10 scale were associated with being older and having a 'high' level of obesity-related expertise.

Multiple Regression Analysis Assumptions

For each multiple regression analysis, the scatter plot of residuals against predicted ORKS-10 scale scores indicates the absence of outliers in solution and that the assumptions of normality, linearity, homoscedasticity are met.

4.5.4 STUDY THREE DISCUSSION

4.5.4.1 ORKS-10 Scale Psychometric Properties

The ORKS-10 scale proved, once again, to be a reliable measure of obesity risk knowledge, with a level of internal consistency for the total scale which exceeds the accepted minimum of a Cronbach's Alpha ≥ 0.7.

While test-retest reliability has been used in the development of previous knowledge scales, as discussed in Section 2.4.3.2.6, the repeated administration of the scale to the same sample within a short period of time was not considered to be a useful indicator of reliability for this study as knowledge, particularly of a topic such as obesity with a high media presence, is a theoretically unstable construct.

Within the 'low' levels of obesity-related expertise group, the p-values for all items fell within the 0.1 to 0.9 range and the ORKS-10 scale produces a good spread of scores with no obvious ceiling or floor effects. Although statistically the spread of scores for this group is non-Gaussian, Figure 4.4 resembles a normal distribution. As predicted, scores of the 'high' levels of obesity-related expertise group produce a ceiling effect, but the spread of scores suggests that, once again, even in this highly knowledgeable group the ORKS-10 scale clearly discriminates between individuals.

In terms of criterion validity, the univariate analyses suggest that there is a positive relationship between level of obesity-related expertise and ORKS-10 scale score. However, as concerns regarding the differences in missing data for the 'moderate' level of obesity-related expertise sample have been raised, the more stringent, multivariate analyses were conducted on participants with 'high' and 'low' levels of obesity-related expertise only.

In the hierarchical multiple regression analysis with age and education level entered in step 1 followed by expertise in step 2, expertise explains a higher proportion of the variance in ORKS-10 scale scores than in the analysis run using data from Study Two; Study Two = 23.9%, Study Three = 42.8%. Analysis of the subset of participants with higher education offers a less conservative estimate of the impact of expertise on ORKS-10 scale scores and reveals that, when the effects of age are controlled for, specific obesity-related expertise accounts for an even higher proportion of the variance (65.5%).

The variable expertise is, therefore, once again accounting for a large proportion of the variance in ORKS-10 scale scores establishing the scale's criterion validity. Both education level and age continue to explain a significant proportion of the variance, indicating that the scale has convergent validity as discussed in Section 2.4.5.3.

Although the ORKS-10 scale is designed to be a norm-referenced instrument, the scores achieved by the sample of participants with 'low' levels of obesity-related expertise can be interpreted as low, when the content of the items that form the scale are taken into account and when compared to the maximum score possible and the scores achieved by those with 'high' levels of obesity-related expertise. While the sample of participants with 'low' levels of obesity-related expertise is not representative of the UK population, this finding does offer some support to the suggestion that levels of knowledge regarding the health risks associated with obesity among the UK population are poor [184, 189, 190]. This claim would, however, need to be verified by surveys of representative populations.

4.5.4.2 Study Strengths & Limitations

4.5.4.2.1 Recruitment Methods

In this study, all of the questionnaires were distributed and completed without the presence of a researcher, which has the potential to negatively affect the response rate obtained and to increase the opportunity for cheating. However, as in Study Two, the potential for cheating was thought to be minimised by the fact that responses were anonymous, so that a high score would not reflect on the individual in any way.

4.5.4.2.2 Response Rate

Although a reasonable response rate was achieved for Study Two (46.1%), only 682 questionnaires were returned from the 1889 distributed (36.1%) in Study Three. This disappointing rate of return is mainly due to the poor response in the sample DHL Aviation (UK) Ltd employees. Due to restrictions imposed by the employer, questionnaire distribution for samples A and B was conducted 'in-house' rather than by the researcher, which may offer an explanation for the poor response in Sample B. It is also worth mentioning that less was done by this organisation's Occupational Health Advisor to promote the study.

As in Study Two, it is clear that the majority of individuals approached were not sufficiently motivated to complete the questionnaire which may have significant, although unobservable effects on the representativeness of the sample.

4.5.4.2.3 Questionnaire Format

Despite every effort being made to faithfully reproduce the paper-and-pen version, completed by the sample of participants with 'low' levels of obesity-related expertise, in the electronic version, completed by the 'high' level of obesity-related expertise group, the questionnaire format must be recognised as a possible confounding factor when interpreting the results of Study Three. In a recent review of the benefits and limitations of online data collection techniques, Granello and Wheaton point out that while there are different views as to the effect of questionnaire format on measurement error, as yet there is no empirical evidence either way [211].

The on-line version was selected as appropriate for the ASO members due to the fact that they had internet access (indicated by their email address given at registration) and the reduced respondent load associated with this method. The paper-and-pen version was selected for the other participants due to concerns regarding the extent of internet access within this group and the potential for introducing systematic bias perhaps in terms of age or social class. On-line data collection techniques, however, do have the potential to produce representative data sets as demonstrated by an Italian study investigating cardiovascular risk factor knowledge [212]. This study utilised a representative, computer-based network of families who had been provided with personal computers and internet access by a large, international opinion poll company, and who had been trained to give weekly responses to questionnaires on commercial, sociological and political issues. This data collection method also produced an excellent response rate of 97.6%, although the authors do not report if any incentives were offered.

4.5.4.2.4 Sample Size

For the majority of variables, there were very few missing values for any item and as these were not considered to represent a significant source of bias, cases with missing data were deleted from the data set [91]. The variable social class did, however, have a relatively high proportion of systematically distributed missing data and the deletion of these cases has the potential to introduce systematic error. The average scores obtained by participants with 'moderate' levels of obesity-related expertise were compared to those with 'low' and 'high' levels of obesity-related expertise in univariate analyses although the results were interpreted with caution due to the inadequate sample size. In order to take these considerations into account, the establishment of the scale's criterion validity focused upon those with 'low' and 'high' levels of obesity-related expertise only, as missing values in these samples were randomly distributed, had adequate power for the univariate analysis and exceeded the minimum requirement of 10 cases per variable [206].

4.5.4.2.5 Sample Representativeness

As discussed in Section 4.4.4.2.4, it is desirable that the samples used for the ORKS-10 scale development are representative of the UK adult population. Although the samples of 'low' obesity-related expertise recruited in Study Three were more diverse than Study Two, particularly in terms of gender and education level, important differences remain between the sample obtained and the UK population. Although, this is not considered to be important for the establishment of reliability and validity in this study, it does reduce the amount of information regarding the scale's performance with other populations.

Once again, the development of the ORKS-10 scale on a mixed-sex sample is not considered to be an important limitation of the study, as gender does not significantly predict ORKS-10 scale scores.

4.5.4.2.6 Readability & Content Validity

Due to the complexity of the items that were selected from the item pool in Study Two, several items from the original ORKS-10 scale were slightly re-worded. This reduced the reading age to the recommended minimum of 12 years and can, therefore, be considered to be appropriate for use with the UK population.

These changes potentially have important implications for applying the content validity data collected using the original ORKS-10 scale items to the modified items. It is, therefore, important to establish the extent to which the wording changes influence the scores obtained; i.e. do the changes make it easier/harder to obtain a particular score. It would, however, not be appropriate to compare the scores obtained by the 'non-experts' in Study Two with scores obtained by those with 'low' levels of obesity-related expertise in Study Three as differences in when data were collected and geographical region may have influenced exposure to health-related information and could represent confounding factors. Instead, a small pilot study was conducted to collect data *concurrently* using the original version used in Study Two and the modified version used in Study Three. A convenience sample of medical students who had received no obesity-related information was used which limits the possible influence of confounding factors due to their relative homogeneity. The findings of this study suggest that the wording changes have no effect on the scores obtained and the conclusions regarding content validity were applicable.

4.5.5 STUDY THREE CONCLUSION

Study Three has confirmed that this short scale assessing knowledge regarding the effects of obesity on health is reliable, discriminant, valid and suitable for use in the UK population.

4.6 CHAPTER FOUR DISCUSSION & CONCLUSIONS

The results of Study Two and Study Three provide persuasive evidence for the ORKS-10's reliability and face, content, criterion and construct validity. However, as discussed in Section 2.4.5, the validation process can be considered to be a continual process involving a range of possible evidence.

Additional validation in the form of concurrent validity could, for example, be established by correlating responses to the ORKS-10 scale with other, well-validated measures of the same construct [54]. Although two studies, conducted by Banasiak and Murr [164] and McArthur, Pena and Holbert [162], have created subscales of items specifically assessing knowledge regarding the health effects of obesity, neither have adequately reported the psychometric properties, making it difficult to consider them 'well-validated'. Alternatively, demonstrating an increase in ORKS-10 scale scores following a health education intervention would confer predictive validity and would provide further support for its use as an assessment tool in clinical settings. There is, however, the potential for a Type II error if the intervention is not effective.

Perhaps the most important limitation of the test construction methodology used to develop the ORKS-10 scale is that it does not guarantee that the scale is unidimensional. The choice of item analysis as the test construction methodology can, however, be defended on the basis that the intention was to develop only one scale from the item pool. In addition, every effort was made to clearly defined the construct in question and write unifactorial items; factors which make the item analytical approach to be a viable alternative to factor analysis [78]. The ORKS-10 scale may, however, in the future be incorporated into a general obesity-related knowledge scale as one of several distinct content domains. The development of such a scale using factor analysis would allow the unidimensionality of the ORKS-10 scale to be investigated empirically.

The ORK-10 scale is designed to be a norm-referenced instrument, placing groups of individuals along a continuum of the construct in question. Arguably, however, the scores for the non-expert group could be also be interpreted as indicating a low level of knowledge since the median score for the sample was only 4 out of a possible 10, with a maximum score of 8, compared to a median score of 9 in the expert group. While the sample of non-experts is not representative of the UK population, this finding does offer some support to the suggestion that levels of knowledge regarding the health risks associated with obesity among the UK population are poor [190].

Although the ORKS-10 scale could be used to investigate a wide range of important clinical, professional and scientific issues, as outlined in Section 3.6, of particular interest is whether obesity-related health risk knowledge predicts weight control behaviour. It is clear from the results of this study that self-reported Body Mass Index does not significantly predict ORKS-10 scale scores in multivariate analysis; a relationship also found in a less stringent univariate correlation analysis (results not shown). This finding does not, however, disconfirm the hypothesis that obesity risk knowledge predicts weight control behaviour due to its cross-sectional nature. The ORKS-10 scale could, however, play a key part in prospective research in order to fully determine the role of obesity risk knowledge in weight control behaviour.

CHAPTER FIVE: OBESITY OUTCOME EXPECTANCY BELIEF SCALE DEVELOPMENT

5.1 CHAPTER FIVE INTRODUCTION

Although the results of the research presented in chapter four provides persuasive evidence for the psychometric acceptability of the Obesity Risk Knowledge Scale, it only deals with physical health consequences. As discussed in Section 1.2, the evidence pertaining to obesity's influence on other aspects of health, notably mental health, is less well established and would, therefore, be more appropriately treated as beliefs. While Ogden has developed two internally consistent belief scales dealing with the medical and psychological consequences of obesity, the author has not published enough detail to critically appraise. It is also unclear as to how the author deemed these to be beliefs salient to her participants. As discussed in Section 3.2, it is thought that beliefs will be more likely to predict behaviour if the respondent considers them relevant.

In addition, it is has been noted that even health-enhancing behaviours are frequently undertaken for reasons unrelated to health [62]. The central role of non-health-related obesity outcome expectancies is supported by a claim in the 'The Weight of the Nation – Obesity in the UK' report that "...for too long, obesity has been perceived as a social or cosmetic issue" (p19, [213]). The British Nutrition Foundation's Task Force Report on Obesity goes on to recommend that "...it would be encouraging if obesity was regarded primarily as a public health problem rather than a cosmetic one" (p206, [190]). However, as oulined in Section 3.4.3, no scales have been developed that measure non-health-related obesity outcome expectancies.

It is also evident from the literature that what research has been done has focused upon positive obesity outcome expectancies (endorsing beliefs in the benefits of weight control behaviour and the costs of being obese). However, as discussed in Section 2.3, behaviour is also thought to be predicted by negative obesity outcome expectancies (not endorsing beliefs in the costs of weight control behaviour and the benefits of being obese). Once again, no scales have been developed that measure negative obesity outcome expectancies.

Creating scales that assess health and non-health, positive and negative obesity outcome expectancy beliefs would, as outlined in Section 2.4, require the development of a pool of items that participants find relevant. A pilot-study would then be required to select the most appropriate items based upon their statistical properties. A second pilot would also be required to ensure that the resultant scale's psychometric properties are stable.

5.2 CHAPTER FIVE AIM

To develop a set of short, reliable and unidimensional subscales to assess salient beliefs regarding positive and negative, health and non-health outcomes of obesity; the Obesity Outcome Expectancy Belief Scale.

5.3 STUDY ONE: ITEM POOL DEVELOPMENT

5.3.1 STUDY ONE AIM

To create a salient pool of belief items from which to develop the Obesity Outcome Expectancy Belief Scale.

5.3.2 STUDY ONE METHOD

5.3.2.1 Study Design

A cross-sectional qualitative study.

5.3.2.2 Sampling

Participants were recruited using purposive sampling to ensure that obese and non-obese individuals with a range of weight loss intentions were involved in the study.

Focused Group Discussion A

Participants were sought on the basis of their personal experience of obesity (BMI $\geq$ 30 kg/m^2) and their experience of attending a hospital outpatient weight management clinic in order to lose weight.

Focused Group Discussion B

Participants were sought on the basis of their personal experience of overweight and obesity (BMI $\geq$ 25 kg/m^2) and their experience of attending a commercial weight loss program in order to lose weight.

Focused Group Discussion C

Participants were sought on the basis of their personal experience of overweight and obesity (BMI $\geq$ 25 kg/m^2) and that they were not actively attempting weight loss.

Individual Interviews

Participants were sought on the basis of their healthy bodyweight (BMI 18.5 – 24.9 kg/m^2) which had been maintained for at least one year, either actively or not actively attempting weight loss.

Eligibility criteria were that participants were aged eighteen or over, with no learning disability which might impair their ability to participate in an interview or group discussion.

5.3.2.3 Instruments

5.3.2.3.1 Discussion Guide

Although the group discussions and individual interviews were intended to be relatively unstructured, a discussion guide was designed to ensure consistency and that the aims of the study were addressed. This contained a series of sections as described by Vaughn, Schumm and Sinagub [214]: welcome, introduction, anonymity, ground rules, warm-up, clarification question, introductory question, key questions followed by a series of prompts, concluding question and conclusion. The key questions included 'What would you say are the most important effects that obesity have on a person?' and 'Do you consider it important that an obese person should attempt to lose weight?' followed by prompts such as 'What do you consider the main benefit would be to them?' and 'What do you consider the main draw-back/downside would be?'.

5.3.2.3.2 Sociodemographic Characteristics

A series of unstructured questions were used to obtain details of age, ethnicity, gender, and weight loss activity. Occupation was obtained using a free response question and status coded using the National Statistics Socio-economic Classification (NS-SEC) [205]. Respondents also recorded their current height and weight from which self-reported Body Mass Index (kg/m^2) was calculated.

5.3.2.4 Procedures

5.3.2.4.1 Recruitment

Focused Group Discussion A

Invitation packs, containing an invitation letter, a patient information sheet, a personal details form, a consent form and a freepost envelope, were distributed to patients attending an appointment at the Queen's Medical Centre University Hospital out-patient weight management clinics, during October 2002. Individuals interested in participating in the study were asked to complete the consent form, a personal details form and return it to the researcher in the freepost envelope provided. Participants were then contacted to arrange the discussion.

Focused Group Discussion B

Invitation packs, as described for Focused Group Discussion A, were distributed to individuals attending one of five Rosemary Connelly Diet and Fitness Clubs across Nottingham, during a one week period of October 2002. Individuals interested in participating in the study were asked to complete the consent form, a personal details form and return it to the researcher in the freepost envelope provided. Participants were then contacted to arrange the discussion.

Focused Group Discussion C

Participants were recruited using posters displayed around the Queen's Medical Centre University Hospital and University of Nottingham, articles published in the Nottingham University student magazine, the Nottingham University staff newsletter and the Nottingham Evening Post local newspaper, and adverts announced on BBC Radio Nottingham and University Radio Nottingham, during October 2002. Interested individuals were invited to contact the researchers by phone or email for further details.

Individual Interviews

Participants for the individual interviews were recruited via posters displayed around the Queen's Medical Centre University Hospital and University of Nottingham, an article published in the Nottingham University staff newsletter, and via email distribution lists during April 2003. Interested individuals were invited to contact the researchers by phone or email for further details.

5.3.2.4.2 Data Collection

Focused Group Discussions

The focused group discussions were all held in a meeting room at the Queen's Medical Centre University Hospital during October and November 2002. The discussions were conducted in accordance with the guidelines suggested by Krueger and Casey [215]. This ensured that participants were provided with a non-threatening forum for between 1 and 2 hours in which they discussed issues that they considered important. Participants were, however, interrupted if they digress to such an extreme that they will be brought back to the topic of inquiry with the key questions. The author acted as the discussion moderator, while a

3rd year BMedSci student acted as the assistant moderator. Discussions were audio-taped and then transcribed verbatim.

Individual Interviews

The individual interviews were either held in a meeting room at the Queen's Medical Centre University Hospital or at the participant's place of work, during April and May 2003. The interviews were conducted in accordance with the guidelines suggested by Denscombe 1998 [216] and Grbich 1999 [217]. This ensured that participants were provided with a non-threatening forum for between 30 and 60 minutes in which they discussed issues that they considered important. Participants were, however, interrupted if they digress to such an extreme that they will be brought back to the topic of inquiry with the key questions. All participants were interviewed by the author. Discussions were audio-taped and then transcribed verbatim.

5.3.2.4.3 Data Analysis

Discussion transcripts were analysed using the NVivo 2.0 software package and thematic analysis. Both descriptive and latent codes were inductively derived from the transcripts and then examined in terms of context [218]. Due to the richness of the data obtained, following a detailed line-by-line coding of the three focus groups, a focused coding strategy was employed for the individual interviews. As described by Charmaz [219], this involves taking codes of particular interest that arise early in the coding process and applying them to the remaining data.

5.3.2.5 Ethical Considerations

This study received approval from the Queen's Medical Centre University Hospital NHS Trust Research and Development and Ethics Committee and the Nottingham University Medical School Ethics Committee (Appendix Three).

5.3.3 STUDY ONE RESULTS & DISCUSSION

5.3.3.1 Respondents' Characteristics

Data was collected from twenty-two participants; five of whom took part in Focused Group Discussion A, four who took part in Focused Group Discussion B, five who took part in Focused Group Discussion C and eight who took part in individual interviews (Table 5.1). Participants were predominately female, although it is notable that at least one male took part in each focused group discussion. Participants ranged in age from 23.0 to 63.0 years and from 19.9 to 56.2 kg/m^2, while just over half of the participants were intending to lose weight. As this sample contained obese individuals actively trying to lose weight in a medical setting, overweight and obese individuals actively trying to lose weight in a non-medical setting, overweight and obese individuals not actively trying to lose weight, and healthy weight individuals both actively and not actively trying to lose weight, of various ages, it is likely that a full range of salient of beliefs was accessed by the study. It is, however, clear that, with the exception of those taking part in Focused Group Discussion A, the majority of participants were from social classes I and II. Similarly, the vast majority were White European. Questions could, therefore, be asked about the saliency of the items derived from this study for subgroups of the population, such as the long-term unemployed and ethnic minorities.

Table 5.1 Respondents' Characteristics

Participant[a]	Gender	Age[b]	Ethnicity	Body Mass Index[c]	Social Class[d]	Active Weight Loss?
Focused Group Discussion A						
Fred	Male	43.27	White European	51.96	III Routine & Manual	Yes
Jackie	Female	22.95	White European	32.42	III Routine & Manual	Yes
Charlotte	Female	50.75	White European	56.22	Long term unemployed	Yes
Sarah	Female	49.63	White European	48.86	I Managerial & Professional	Yes
Peter	Male	63.02	White European	47.84	Retired	Yes
Focused Group Discussion B						
Jane	Female	51.56	White European	31.01	II Intermediate	Yes
Penny	Female	29.03	White European	36.40	II Intermediate	Yes
Clare	Female	40.76	White European	28.89	Student	Yes
Nick	Male	47.17	White European	38.17	II Intermediate	Yes
Focused Group Discussion C						
Amy	Female	26.16	White European	27.32	I Managerial & Professional	No
Duncan	Male	30.46	White European	42.38	Student	No
Sunita	Female	36.13	Asian	33.33	I Managerial & Professional	No
Beverley	Female	48.57	White European	47.18	II Intermediate	No
Kylie	Female	43.73	White European	29.18	I Managerial & Professional	Yes
Individual Interviews						
Vanessa	Female	25.80	White European / Asian	24.41	I Managerial & Professional	Yes
Malcom	Male	26.03	White European	21.11	Student	No
Clarence	Male	34.26	White European	24.07	I Managerial & Professional	Yes
Ruth	Female	25.11	White European	19.99	I Managerial & Professional	No
Mary	Female	41.39	White European	19.89	I Managerial & Professional	No
Georgina	Female	26.83	White European	22.96	II Intermediate	No
Margaret	Female	34.20	White European	22.30	I Managerial & Professional	Yes
Gail	Female	52.13	White European	24.72	II Intermediate	Yes

[a]False names; [b]Years; [c]kg/m^2; [c]Social Class according the NS-SEC three class system [205]

5.3.3.2 Major Themes

5.3.3.2.1 Social Impacts of Obesity & Social Benefits of Weight Control

In each of the focused group discussion and individual interviews, participants discussed the negative manner in which obesity was viewed by other people.

> *...what sort of factors would you identify someone as being above ideal weight?*
> *Moderator*

> *Erm, I think you tend to have, there are sort of a whole range of pejorative words...*
> *Nick*

and identified a wide range of anti-fat attitudes that included laziness, personal hygiene, intelligence and incompetence.

> *It's like a stigma isn't it, attached to people?*
> *Gail*

Of particular interest was that a number of participants described the way in which people deriving humour out of individuals' obesity.

> *... being fat is one of the things people joke about everything from a whole measure of school kids up and to even adults*
> *Clarence*

It was, however, notable that this aspect was not discussed in any of the focused group discussions. It is interesting to speculate whether these obese individuals were relatively unaware of this derision due to the fact that these 'jokes' circulate primarily amongst the non-obese.

Anti-fat attitudes were, however, translated into behaviour that was recognised by all participants: staring and negative comments from other people.

> *I think, lack of respect from people around you. People are very cruel and I think that you must notice that if you were obese that people around don't really think much of you because you are so overweight*
> *Ruth*

> *...some people who will wind down their windscreen, at the side window of their cars as they go by and yell abuse at you just because you're on, er, the plump side, so ...*
> *Duncan*

It was also interesting to observe that these negative comments were supplemented by positive comments following weight loss

> *...but now [I've lost weight] people that know me, even people I haven't seen, say 'Cor, look at you. Aren't you looking good?'*
> *Penny*

There was also a strong sense that obese individuals did not enjoy a complete social life.

> *I mean I wouldn't ever go into a room full of people I didn't know [before I lost weight]. The thought of that just made me feel physically sick. And if I could get into a room and sneak along the wall and sit at the back, I would do that rather than stand there in front of these thin people. It was just terrifying.*
> *Penny*

This, however, was not only attributed directly to other people's reactions towards them but also to a lack of self-confidence.

Obesity's negative impact on employment was less strongly endorsed, with both obese and non-obese individuals questioning the extent to which it occurred. However, there was a general opinion that for certain jobs, such as in the emergency services, the exclusion of obese individuals was acceptable on the basis that they were physically unable to perform their duties.

> *I would like to say 'no' but I think there are effects on employment and I would say in more active jobs that it's definitely looked at, erm, more closely.*
> *Margaret*

> *There will be certain tasks that can't be done by someone that is very obese...*
> *Malcolm*

Of those participants endorsing obesity's impact on employment, both anti-fat attitudes and the likelihood of future health problems were cited as factors that influenced an obese individual during a job interview.

The responses coded under the theme Social Impacts of Obesity & Social Benefits of Weight Control were used to generate the following eight statements:

An ideal bodyweight is more socially acceptable.
People with an ideal bodyweight are taken more seriously.
Obese people would be treated better if they lost weight.
Obese people would have a better social life if they lost weight.
Very overweight people have poorer job prospects.
There is a stigma attached to obesity.
Very overweight people are made fun of.

5.3.3.2.2 Aesthetic Impacts of Obesity & Aesthetic Benefits of Weight Control

One of the most freely discussed impacts of obesity, particularly among the focused group discussions but also the individual interviews, involved clothing. Weight change was often identified as positive or negative due to its effect on clothing fit.

> *If your clothes are tight or you suddenly think 'oh you look awful in that', or the dress that fitted you last year when you went to the Christmas do, you were bulging, you got to breath in. I think you notice those more [than health effects].*
> *Clare*

There was also a strong feeling amongst the most overweight participants that clothing in plus-sizes is not readily available

> *There have been times with me where I have been grateful just to buy anything that I can get into.*
> *Sarah*

> *Right, so you've not had the choice?*
> *Moderator*

> *No. It's either that or, erm, my birthday suit.*
> *Sarah*

and over-priced.

> *But it's a captive market...*
> *Peter*

> *Yeah*
> *Jackie*

> *... and they over charge.*
> *Peter*

> *Yeah, I must admit that is true. You are paying for bigger clothes aren't you but the higher prices they are ridiculous.*
> *Fred*

The clothing that is available in plus-sizes was, however, considered by the youngest participants to be old-fashioned and unflattering

> *Sort of in, I don't know about for the older ladies, but certainly my age group places like New Look and Dorothy Perkins have started to slowly introduce the bigger sizes but then in a way they have kind of got it wrong, because they've tried to create clothes which are in the same style as a size 8 as a size 24 and it just doesn't ... they still haven't got it right.*
> *Jackie*

> *Hmm, it just doesn't work*
> *Sarah*

> *You look almost as bad because they have tried to create something which doesn't suit your body shape.*
> *Jackie*

Less well discussed, particularly amongst the oldest participants, was the impact of obesity on being considered and feeling attractive, and the effect that this had on finding a partner. This was, however, discussed by both male and female participants. One participant in particular felt that

> *...many people don't regard [obese people] as sexually attractive as less, erm, less plump people and so, er, this would make it harder, erm, to find a partner in life*
> *Duncan*

although another participant challenged this view.

> *Well no, I wouldn't have thought that would be because you know what the person's like, you've met the person as she is, or as he is, you know what they're like and so, you know, you accept them for what they are*
> *Gail*

In addition, obesity was thought to make people look older, less smart and less efficient.

> *...it's hard to look smart and efficient if you are very overweight. Well I can think of some examples where I've seen, how other people have been viewed in offices.*
> *Kylie*

These visual aspects of obesity were thought to have a significant negative impact on an individual's self-esteem and confidence. In particular, obesity was considered to be a source of embarrassment

> *You know I don't think anybody likes being fat and I find it a terrible embarrassment.*
> *Peter*

The responses coded under the theme Aesthetic Impacts of Obesity & Aesthetic Benefits of Weight Control were used to generate the following seven statements:

Very overweight people are considered less attractive.
Obese people are embarrassed by the way they look.

To look good it is important to maintain an ideal bodyweight.
It is harder for an obese person to look smart and efficient.
It is harder for obese people to find fashionable clothes.
Losing weight improves an obese person's appearance.
It is easier for people to find a partner if they are not obese.

5.3.3.2.3 Health Impacts of Obesity & Health Benefits of Weight Control
During all of the discussions, participants spontaneously discussed the medical impacts of obesity when asked about what effects obesity has on a person.

Medically there are a lot of disadvantages where obesity is concerned
Sunita

Because they need more health care which costs everybody and everybody's taxes and the rest of it
Clarence

There was also some recognition, although not as pervasive, of the benefits of weight loss for the obese.

...if you don't lose five stone you are going to die...
Penny

It was also interesting to note that, when asked to define obesity as part of the clarification question, participants frequently referred to health.

...what you understand by the term obesity – what that means to you?
Moderator

Somebody who is overweight and at a stage that would cause, erm, erm, detriment to their health
Margaret

However, they also evoked a wide range of possible effects including confidence and social reactions. Particularly pervasive was the view that obesity and ideal weight could not be, and should not be, classified using objective, medical criteria but instead, was a personal judgment.

> *I mean, I don't think I particularly would ever want to be what my doctor says is my ideal weight, which is I think about seven and a half stone ... some people might want to be the seven and a half stone somebody might still be quite happy at ten stone and a size eighteen because they are happy. They are not bothered and I think that is where it's... what your ideal is what you are happy, truly happy at.*
> *Penny*

Obesity was very much viewed as preventing optimal quality of life by restricting normal activities due to joint pain, low energy levels, and ability to move.

> *Well, being able to lead the sort of life you want ... without being tied down because everything you do is painful or it's difficult to do the sorts of things that you normally expect to be able to do.*
> *Beverley*

> *It closes a lot of doors, it must close a lot of doors on what options what you can do.*
> *Malcolm*

Although all participants recognised the health implications of obesity and health benefits associated with weight loss for the obese, these tended to be discussed with less enthusiasm than issues such as clothing. Participants used short, brusque sentences when discussing health risks which contrasted to the fuller, more enthusiastic discussion of clothing

It was interesting to observe that the participants who partook in Focused Group Discussion A were particularly reticent to discuss the health implications of obesity. This was despite the fact that, out of all the participants, they were at the greatest risk, if not already suffering from, obesity-related comorbidity. One comment in particular seemed to illustrate the difficulty that individuals had discussing the impacts of their obesity.

> *...it's your own fault but they are they, they are problems.*
> *Peter*

Although participants were generally unforthcoming regarding obesity's health risks, they were able to identify a range of specific obesity-related comorbidities, usually in the form of a short list.

> *What sort of long term disadvantages are you referring to there?*
> *Moderator*

> *Increased risks of heart and... heart disease, stroke, erm, some forms of cancer.*
> *Charlotte*

Perhaps by using standard medical terminology, participants felt that a common understanding was reached between themselves and the researcher and, therefore, did not feel the need to expand further on these issues. Alternatively, participants may have found these obesity-related outcomes to be abstract and, therefore, difficult to articulate. It was notable that participants tended to be more effusive if they had personal or family experience of a particular condition or had an understanding of how obesity caused its effect.

> *When you think about it, you've been carrying extra weight around, it's bound to but more pressure on each joint. You have only got to be walking and your knees are taking all that pressure and weight and so ...*
> *Penny*

Although participants did not often discuss obesity's effect on health directly in terms of mental health problems, they did refer to range of psychological effects including self-consciousness, self-confidence, self-esteem and feeling low. In particular, being obese was associated with being unhappy, while weight loss was associated with feeling happier.

> *I think [obesity] would make someone very depressed and feel like an inadequate member of society ... [obese people] have such a crap life ... quite an unhappy life*
> *Ruth*

> *I think I am happier than I was [having lost weight] but I'm still not happy.*
> *Jackie*

The responses coded under the theme Health Impacts of Obesity & Health Benefits of Weight Control were used to generate the following eight statements:

Obesity prevents a person from getting the most out of life.
Very overweight people would be happier if they lost weight.
Obesity has serious medical consequences.
An obese person needs more medical care.
Obese people have more mental health problems.
People should maintain an ideal bodyweight for optimal health.
Losing weight would greatly improve obese people's health.
A person with an ideal bodyweight can lead a more active life.

5.3.3.2.4 Benefits of Obesity & Disadvantages of Weight Control

Although they were able to discuss the health impacts of obesity as described in Section 5.3.3.2.3, in each of the three focused group discussions participants raised concerns regarding the extent to which obesity affected health. This was particularly pervasive in Focused Group Discussion A and perhaps reflects a reaction against unbalanced health risks messages that contradict evidence from other sources.

I think you can be overweight and be perfectly healthy and perfectly fit
Mary

I don't think necessarily all these things are caused by weight but on the other hand weight doesn't help them.
Peter

But there are some overweight people that can go through life and not have anything can't they... They always blame the weight for a heart attack but thin people have heart attacks don't they?
Jane

One women in particular felt that her health had improved since she had stopped trying to lose weight.

> *My health has been excellent, not had any problems that I did use to have when I was much slimmer.*
> *Beverley*

A frequent topic of discussion, particularly amongst those trying to lose weight, was that weight control is associated with a significant loss of pleasure.

> *... I have levelled off at something where I can eat whatever I like, drink whatever I like, just have my life ... and I don't have to ... I don't deny myself anything that I want.*
> *Beverley*

> *Because I just feel sometimes that you are on a long life diet all the time, do you know what I mean?*
> *Jane*

Relaxation and food and drink in particular were often seen as central to fulfilled lifestyle, something that weight control efforts interfered with.

> *If they're happy and it's at the expense of other areas of their life, then perhaps [obese people should not attempt to lose weight].*
> *Georgina*

> *... eating sensibly can become boring. It's not tasty or tactile or... I don't know*
> *Clare*

> *I know very, very clearly that it's much better for her if she can lose a significant amount of weight, and I do mean significant, erm, that doesn't really fit in with the happy lifestyle that she has*
> *Nick*

Weight control was widely recognised as requiring a lot of sustained effort to achieve

> *It's easy to put it on but hard to get rid of [unclear], lets put it like that.*
> *Fred*

> *...is it worth struggling to get any more off?*
> *Sarah*

while some suggested that it was expensive.

> *... you will get some food less than one percent fat less than two percent fat on the label and those are... little expensive because they process it ...*
> *Sunita*

As it was expected that participants would discuss the negative impacts of obesity most readily, they were directly asked if they could identify any positive impacts. It was interesting to observe that this was often greeted by laughter from the participants, perhaps suggesting that they considered it a ridiculous question. Although the participants appeared to consider their response fully, often taking some time to think it through, they often did not identify anything explicitly positive – just the absence of negative impacts.

> *My immediate thought is no so now I'm desperately racking my brains to think of anything, anything really. Er, no, I can't think of any overt advantages really. Lots of areas where you wouldn't be disadvantaged in any way, but I can't think of any overt advantages really.*
> *Mary*

However, several participants did discuss that obese people were not considered to be threatening to other people's sense of security and appear trustworthy although this was as a result of not being perceived as sexually attractive.

> *So you do find that although you lose weight, you make other people feel uncomfortable ... since I've lost weight you do find women become very much more competitive.*
> *Georgina*

> *...people are said to trust plumper people ... that they find them trustworthy and, erm, friendly and, er, I don't know probably the word is cuddly, but, er, you know because it's almost as if they don't, I don't know, see them as a ... as a romantic threat or anything so... so therefore they they, erm ... they, erm, make... make, like I say, make the episode platonic.*
> *Duncan*

Interestingly, one participant also suggests that

> *I think also that some of his identity, personal identity would have been lost if he had lost weight*
> *Vanessa*

While this concurs with the responses described in section 5.3.3.2.1 and above that obesity is something that is judged by others, they suggest that changing it, for better or for worse, may negatively impact on an individual's sense of self.

The responses coded under the theme Benefits of Obesity & Disadvantages of Weight Control were used to generate the following eighteen statements:

There is very little proof that obesity causes health problems.
It is better to be very overweight and happy.
Maintaining an ideal bodyweight is boring.
The effects of obesity on health are exaggerated.
Losing weight can make an obese person unhappy.
Maintaining an ideal bodyweight takes a lot of effort.
Weight loss can cause just as many health problems as obesity.
People have to deny themselves a great deal to avoid obesity.
Obese people make good friends.
Maintaining an ideal bodyweight makes life less fun.
Obesity rarely requires medical treatment.
A person who avoids obesity has a restricted lifestyle.
Very overweight people get more out of life.
Losing weight affects an obese person's identity.
There is no guarantee that obesity will cause poor health.
People who try to maintain an ideal bodyweight are boring.
Maintaining an ideal bodyweight is expensive.
Very overweight people are more trustworthy

5.3.3.2.5 Other Themes

To ensure that this investigation, as far as possible, revealed beliefs that were salient to the participant and not the researcher, the discussions often covered issues that were unrelated to obesity outcome expectancies. Of particular interest were views regarding the causes of excess adiposity and whether an individual could be held accountable for their obesity. Although most participants recognised the influence of genetic determinants of obesity and described eating in terms of an addiction, there were equally many acknowledgments of the individual's role. While there was a strong sense that an obese person could not and should not be pressurised into losing weight, it was interesting that several obese and non-obese participants discussed whether it was unfair that the medical costs resulting from obesity were covered by non-obese individuals' taxes. As these issues were not prompted by any of the questions asked by the researcher, this suggests that participants found them to be particularly salient and, therefore, might profit from further investigation.

5.3.4 STUDY ONE CONCLUSION

As the items generated for the Obesity Outcome Expectancy Belief Scale item pool incorporated views expressed by all participants during relatively unguided discussions, it is likely that they represent relevant beliefs. Items not only reflected the content of the beliefs expressed but also, as far as possible, the language used. Items are, therefore, likely to both salient and engaging for a general UK population.

5.4 STUDY TWO: INITIAL SCALE DEVELOPMENT

5.4.1 STUDY TWO AIM

To develop a set of short, reliable and unidimensional subscales to assess beliefs regarding both health and non-health outcomes of weight control behaviour from the item pool.

5.4.2 STUDY TWO METHOD

5.4.2.1 Study Design

A cross-sectional survey.

5.4.2.2 Sampling

An opportunistic sample of staff at John Lewis Peterborough attending their weekly Communications Meeting on Thursday 25th March 2004 was invited to participate. John Lewis Peterborough is one of 26 general department stores owned by The John Lewis Partnership and is located in Northamptonshire. The store has a full-time Occupational Health Advisor responsible for a wide range of staff health and safety issues.

5.4.2.3 Measures

5.4.2.3.1 Obesity Outcome Expectancy Belief Scale Item Pool

As discussed in Section 5.3, the salient beliefs regarding the consequences of weight control behaviour, identified during in-depth interviews and focus groups, were used to develop a 40 item pool. All items were designed to be self-administered and had a seven-point Likert scale response format. The 18 items assessing beliefs regarding the costs of and barriers to weight control were scored as 'strongly agree' = 1, 'agree' = 2, 'moderately agree' = 3, 'neither agree nor disagree' = 4, 'moderately disagree' = 5, 'disagree' = 6, 'strongly disagree' = 7. In contrast, the 22 items assessing the health, social and aesthetic benefits of weight control were all scored in the reverse direction with 'strongly agree' = 7 and 'strongly disagree' = 1. In this way, higher scores indicate higher utility for weight control behaviour.

5.4.2.3.2 Sociodemographic Characteristics

A series of unstructured questions were used to obtain details of age, gender, marital status, ethnicity and level of education. Occupation was obtained using a free response question and status coded using the National Statistics Socio-economic Classification (NS-SEC) [205]. Respondents also recorded their current height and weight from which self-reported Body Mass Index (kg/m^2) was calculated.

5.4.2.4 Procedures

5.4.2.4.1 Data Collection

One week prior to the distribution of the questionnaires, posters were displayed on the Occupational Health pin-boards to promote the study. Department Managers received fact-sheets and oral explanations of the study from the in-house Occupational Health Advisor and were then requested to distribute questionnaires to every member of staff attending their weekly Communications Meeting on the 25th March 2004. Staff received a verbal reminder and thanked for their participation by Departmental Managers at the following week's Communications Meeting. Any questionnaires that were not distributed to staff were returned to the Occupational Health Advisor. All questionnaires were accompanied by a covering letter/information sheet and a freepost envelope in which participants were invited to return their responses. All responses were anonymous unless participants indicated that they would be willing to take part in a test-retest reliability check by providing their contact details. After a period of 3 months, participants providing contact details were invited to complete a duplicate questionnaire. No incentives were offered.

5.4.2.4.2 Data Analysis

All data analyses were conducted using SPSS (Version 11.5). The data from the initial item pool was subjected to an item analysis as described in Section 2.4.4.2.1 to remove unreliable and non-discriminating items. The retained items were then subject to a series of factor analyses in which items were systematically removed to produce a number of short, unidimensional subscales reflecting salient underlying constructs as outlined in Section 2.4.3. The Obesity Outcome Expectancy Belief Scale produced by the item and factor analyses was then assessed in terms of temporal reliability using a test-retest check and internal consistency using Cronbach's Alpha Coefficient. Scores achieved on the proposed Obesity Outcome Expectancy Belief Scale were also investigated using descriptive and univariate statistics.

5.4.2.5 Ethical Considerations

This study received approval from the Nottingham University Medical School Ethics Committee (Appendix Three). Individuals were considered to have consented to their participation in the study if they completed and returned a questionnaire. All responses were anonymous.

5.4.3 STUDY TWO RESULTS

5.4.3.1 Response Rate

Of the 437 people invited to participate in this study, 203 responses were received resulting in a response rate of 46.45%.

5.4.3.2 Initial Data Screening

5.4.3.2.1 Descriptive Statistics

Descriptive statistics for all items were inspected and were found to have no out-of-range values and reasonable means and standard deviations (Table 5.2).

5.4.3.2.2 Missing Data

The data set was screened for missing values using SPSS Missing Value Analysis. As no item was missing more than one value (0.49%), t-tests were not requested to investigate whether the missing values were related to any other variable. Fifteen cases with missing values were deleted from the data set resulting in a sample size of 188 and a useable response rate of 43.0%.

5.2.3.3 Respondents' Characteristics

Within the sample of 188 useable responses, participants ranged in age from 16.64 to 65.56 years (n = 184, mean = 41.39 years, s.d = 13.19 years). The majority of this sample were female (n = 138, 73.4%), married / co-habiting (n = 122, 64.9%), White British / European (n = 177, 94.1%) and had not received a higher education qualification (i.e. BTEC/A-level/Scottish Higher qualification or more advanced) (n = 109, 58.0%). All three social classes were represented, with the majority of participants having routine and manual occupations (n = 91, 48.4%), followed by managerial and professional occupations (n = 51, 27.1%) and intermediate occupations (n = 38, 20.2%). In the majority of participants, self-reported Body Mass Index (BMI) was within the range of 18.5–25 kg/m^2 (n = 106, 56.4%), although a sizeable proportion exceeded the recommended BMI of 25 kg/m^2 (n = 69, 36.7%). Ninety-two participants provided contact details and were mailed duplicate questionnaires for completion after a period of 3 months. From this, 75 responses were received giving a response rate for the test-retest reliability check of 81.5%.

Table 5.2 Study Two: Obesity Outcome Expectancy Belief Scale Item Pool Descriptive Statistics

Item		Mean	SD	Range
Health Benefits of Weight Control				
1	Obesity prevents a person from getting the most out of life.	2.20	1.36	1 - 7
4	Very overweight people would be happier if they lost weight.	3.17	1.50	1 - 7
14	Obesity has serious medical consequences.	2.52	1.50	1 - 7
21	An obese person needs more medical care.	3.11	1.41	1 - 7
31	Obese people have more mental health problems.	4.46	1.34	1 - 7
36	People should maintain an ideal bodyweight for optimal health.	2.70	1.26	1 - 7
37	Losing weight would greatly improve obese people's health.	2.47	1.19	1 - 7
43	A person with an ideal bodyweight can lead a more active life.	2.30	1.22	1 - 7
Social Benefits of Weight Control				
2	An ideal bodyweight is more socially acceptable.	2.34	1.18	1 - 7
5	People with an ideal bodyweight are taken more seriously.	2.99	1.60	1 - 7
13	Obese people would be treated better if they lost weight.	3.29	1.41	1 - 7
17	Obese people would have a better social life if they lost weight.	3.14	1.53	1 - 7
38	Very overweight people have poorer job prospects.	3.32	1.56	1 - 7
42	There is a stigma attached to obesity.	2.17	1.14	1 - 7
44	Very overweight people are made fun of.	2.43	1.25	1 - 7
Aesthetic Benefits of Weight Control				
8	Very overweight people are considered less attractive.	2.83	1.55	1 - 7
10	Obese people are embarrassed by the way they look.	3.45	1.40	1 - 7
20	To look good it is important to maintain an ideal bodyweight.	3.56	1.54	1 - 7
23	It is harder for an obese person to look smart and efficient.	3.34	1.50	1 - 7
28	It is harder for obese people to find fashionable clothes.	2.21	1.18	1 - 7
33	Losing weight improves an obese person's appearance.	2.73	1.31	1 - 7
39	It is easier for people to find a partner if they are not obese.	3.13	1.46	1 - 7
Costs of and Barriers to Weight Control				
3	There is very little proof that obesity causes health problems.	2.18	1.58	1 - 7
6	It is better to be very overweight and happy.	3.43	1.58	1 - 7
7	Maintaining an ideal bodyweight is boring.	3.65	1.83	1 - 7
9	The effects of obesity on health are exaggerated.	2.70	1.59	1 - 7
11	Losing weight can make an obese person unhappy.	3.66	1.51	1 - 7
15	Maintaining an ideal bodyweight takes a lot of effort.	5.12	1.68	1 - 7
18	Weight loss can cause just as many health problems as obesity.	4.38	1.63	1 - 7
19	People have to deny themselves a great deal to avoid obesity.	3.16	1.62	1 - 7
22	Obese people make good friends.	4.15	1.30	1 - 7
24	Maintaining an ideal bodyweight makes life less fun.	3.13	1.50	1 - 7
25	Obesity rarely requires medical treatment.	2.36	1.08	1 - 7
27	A person who avoids obesity has a restricted lifestyle.	2.74	1.48	1 - 7
29	Very overweight people get more out of life.	2.45	1.10	1 - 6
30	Losing weight affects an obese person's identity.	3.34	1.58	1 - 7
32	There is no guarantee that obesity will cause poor health.	3.40	1.60	1 - 7
34	People who try to maintain an ideal bodyweight are boring.	2.61	1.37	1 - 7
40	Maintaining an ideal bodyweight is expensive.	3.30	1.85	1 - 7
41	Very overweight people are more trustworthy.	2.93	1.29	1 - 6

5.4.3.4 Item Analysis

5.4.3.4.1 Stage 1: Item Semantics

Before data was subject to the traditional item analysis, three items were removed from the item pool following participant feedback and semantic considerations; items 39 ('It is easier for people to find a partner if they are not obese'), 42 ('There is a stigma attached to obesity') and 44 ('Very overweight people are made fun of').

5.4.3.4.2 Stage 2: Item Discrimination

Among the remaining 37 items, the p-value of items 14, 22 and 28 exceeded 0.9 while the proportion of respondents using the neutral response exceeded 0.35 in items 11, 22, 31, and 41 (Table 5.3). These 6 items were removed from subsequent analyses.

Table 5.3 Study Two: Obesity Outcome Expectancy Belief Scale Item Pool Discrimination Statistics

		p-value	% neutral
11.	Losing weight can make an obese person unhappy.	0.40	0.36⁺
14.	Obesity has serious medical consequences.	0.92*	0.03
22.	Obese people make good friends.	0.07*	0.66⁺
28.	It harder for obese people to find fashionable clothes.	0.91*	0.03
31.	Obese people have more mental health problems.	0.15	0.52⁺
41.	Very overweight people are more trustworthy.	0.49	0.48⁺

* *0.1 < p-values > 0.9*
⁺ *Frequency of neutral response > 0.35*

5.4.3.4.3 Stage Three: Item Homogeneity

Among the remaining 31 items, all four proposed domains had Cronbach's Alpha Coefficients ≥ 0.7; Social Benefits of Weight Control (5 items) = 0.69, Health Benefits of Weight Control (6 items) = 0.72, Aesthetic Benefits of Weight Control (5 items) = 0.72 and Costs of and Barriers to Weight Control (15 items) = 0.76.

Five items, however, produced a corrected item-total correlation less than 0.3; from the Health Benefits of Weight Control domain item 4 ('Very overweight people would be happier if they lost weight') and from the Costs of and Barriers to Weight Control domain items 6, 9, 18 and 25 ('It is better to be overweight and happy', 'Weight loss can cause just as many health problems as obesity' and 'Obesity rarely requires medical treatment', respectively). These five items were removed from the item pool.

5.4.3.5 Factor Analysis

5.4.3.5.1 Normality

All 26 items surviving the initial item analysis were found to have significantly skewed distributions (One-Sample Kolmogorov-Smirnov Test; $p < 0.001$) (Table 5.4). When items were reflected as appropriate and subject to square root transformation, no advantage was conferred as skewness was reversed and increased (Table 5.4). Items were, therefore, analysed in their original form.

Table 5.4 Study Two: Obesity Outcome Expectancy Belief Scale Item Pool Distribution Statistics

Item	Skewness	Kurtosis	Transformed Skewness	Transformed Kurtosis
Health Benefits of Weight Control				
1	1.81*	3.36	-2.40*	6.18
21	0.67*	-0.31	-1.02*	0.45
36	0.95*	0.71	-1.42*	2.49
37	1.58*	3.07	-2.21*	6.11
43	1.74*	3.44	-2.32*	6.22
Social Benefits of Weight Control				
2	1.82*	3.98	-2.47*	7.22
5	0.63*	-0.47	-1.01*	0.36
13	0.66*	-0.14	-1.09*	0.89
17	0.61*	-0.42	-1.00*	0.47
38	0.57*	-0.35	-1.01*	0.56
Aesthetic Benefits of Weight Control				
8	1.06*	0.09	-1.37*	0.94
10	0.59*	-0.27	-1.02*	0.70
20	0.27*	-0.93	-0.60*	-0.49
23	0.75*	-0.15	-1.16*	0.84
33	1.24*	1.22	-1.68*	2.78
Costs of and Barriers to Weight Control				
3	2.01*	3.54	-2.45*	5.56
7	0.23*	-1.41	-0.47*	-1.07
15	-1.05*	0.07	-1.37*	0.92
19	0.60*	-0.78	-0.92*	-0.04
24	0.62*	-0.69	-0.92*	0.07
27	0.92*	0.03	-1.29*	1.24
29	0.44*	-0.86	-0.63	-0.63
30	0.44*	-0.86	-0.79*	-0.06
32	0.34*	-0.87	-0.67*	-0.37
34	0.96*	0.26	-1.32*	1.70
40	0.68*	-0.90	-0.95*	-0.30

* Significant skewness from normality (One-Sample Kolmogorov-Smirnov Test ($p < 0.001$))

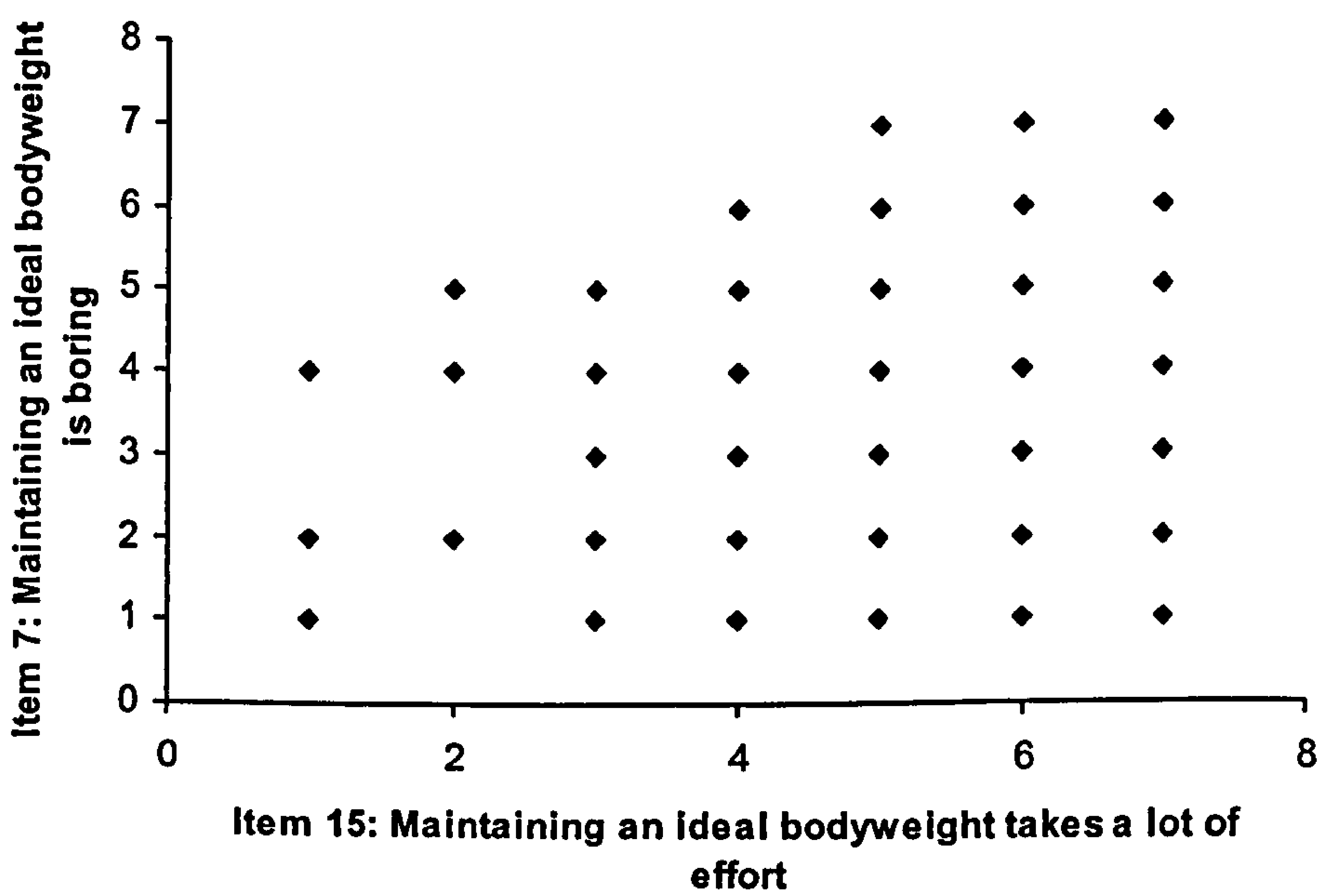
5.4.3.5.2 Univariate & Multivariate Outliers

Nine cases with standardized scores in excess of 3.29 ($p < 0.001$, two-tailed test) on one or more of the 26 remaining items were considered to represent significant univariate outliers. One of these nine cases along with four other cases were considered to represent significant multivariate outliers (i.e. displayed a Mahalanobis distance greater than $\chi^2(26) = 54.052$ ($p < 0.001$)).

5.4.3.5.3 Linearity & Homoscedasticity

As all variables had non-Gaussian distributions, several bivariate plots involving selected variables with the most discrepant distributions were inspected for non-linearity and heteroscedasticity; question 3 and 2 which had moderate negative skewness, question 15 with moderate positive skewness and questions 7 and 20 with minimal skewness (Table 5.4). The scatterplots overall shape were not oval indicating that the variables investigated did not display a perfectly linear relationship although there was no evidence of curvilinearity. Heteroscedasticity was also evident in the relationship of several variables, for example in the greater variability of scores on item 15 for low than high values of item 2 (Figure 5.1).

Figure 5.1 Study Two: Scatter Plot of Responses to Items 7 and 15



5.4.3.5.4 Stage 1: Initial 27 Item Factor Solution (P2-A)

The factor analysis on the 26 items retained from the original item pool was performed using the Principal Factor Analysis extraction method and Oblimin rotation with Kaiser Normalization. A four factor solution was requested which accounted for 36.52% of the total variance (Table 5.5). Within the reproduced correlation matrix, 85 (26.0%) of the non-redundant residuals exceeded 0.05 and the Kaiser-Meyer-Olkin Measure Sampling Adequacy coefficient equalled 0.81.

Table 5.5 Study Two: Total Variance Explained by Initial 26 Item Factor Solution (P2-A)

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Factor	Total	% of Variance	Cumulative %	Total
1	4.67	17.97	17.97	3.86
2	2.99	11.50	29.47	2.91
3	1.08	4.14	33.61	3.73
4	0.76	2.91	36.52	1.10

Using the content of items with significant (>0.3) factor loadings (Table 5.6), the underlying dimension represented by each factor was inferred. Factor one is interpreted as a general Social and Aesthetic Benefits of Weight Control domain, factor two as a Costs of and Barriers to Weight Control domain, factor three as a Health Benefits of Weight Control domain and factor four is tentatively interpreted as a Health-Specific Costs of and Barriers to Weight Control domain

However, factor 4 ('Health-Specific Costs of and Barriers to Weight Control') explains a significant proportion of the variance in only two items which load significantly (>0.3) and exclusively (items 3 and 32) and was removed from subsequent analyses. Five items (1, 20, 23, 29 and 33) failed to load significantly and exclusively on a factor which represented an appropriate domain (Table 5.6) and were also removed from the item pool. In addition, item 34 was removed as it had a very similar content to item 7 which had a higher factor loading.

Table 5.6 Study Two: Initial 26 Item Factor Analysis (P2-A) Pattern Matrix[a]

		Factor			
		1	**2**	**3**	**4**
Health Benefits of Weight Control					
1.	Obesity prevents a person from getting the most out of life	0.35	0.18	-0.12	0.25
21.	An obese person needs more medical care	0.10	-0.05	-0.49	-0.11
36.	People should maintain an ideal bodyweight for optimal health	-0.06	0.18	-0.63	0.05
37.	Losing weight would greatly improve obese people's health	-0.14	-0.05	-0.83	-0.08
43.	A person with an ideal bodyweight can lead a more active life	-0.03	0.02	-0.70	0.04
Social Benefits of Weight Control					
2.	An ideal bodyweight is more socially acceptable	0.41	0.09	-0.16	0.26
5.	People with an ideal bodyweight are taken more seriously	0.53	0.00	0.05	0.04
13.	Obese people would be treated better if they lost weight	0.73	-0.02	0.02	0.02
17.	Obese people would have a better social life if they lost weight	0.62	0.06	-0.05	-0.08
38.	Very overweight people have poorer job prospects	0.37	-0.02	-0.17	-0.14
Aesthetic Benefits of Weight Control					
8.	Very overweight people are considered less attractive	0.66	-0.11	0.03	-0.17
10.	Obese people are embarrassed by the way they look	0.52	-0.16	-0.04	-0.02
20.	To look good it is important to maintain an ideal bodyweight	0.24	-0.02	-0.43	0.09
23.	It is harder for an obese person to look smart and efficient	0.41	-0.08	-0.36	-0.15
33.	Losing weight improves an obese person's appearance	0.19	-0.14	-0.48	0.03
Costs of and Barriers to Weight Control					
3.	There is very little proof that obesity causes health problems	0.09	0.15	-0.00	-0.49
7.	Maintaining an ideal bodyweight is boring	-0.17	0.55	-0.04	-0.03
15.	Maintaining an ideal bodyweight takes a lot of effort	0.01	0.53	0.05	-0.14
19.	People have to deny themselves a great deal to avoid obesity	-0.10	0.43	0.10	-0.33
24.	Maintaining an ideal bodyweight makes life less fun	-0.11	0.78	-0.02	0.00
27.	A person who avoids obesity has a restricted lifestyle	0.08	0.51	0.09	-0.16
29.	Very overweight people get more out of life	0.21	0.23	-0.20	-0.13
30.	Losing weight affects an obese person's identity	-0.08	0.37	-0.05	0.06
32.	There is no guarantee that obesity will cause poor health	0.09	0.10	-0.22	-0.45
34.	People who try to maintain an ideal bodyweight are boring	0.10	0.58	-0.01	0.20
40.	Maintaining an ideal bodyweight is expensive	0.09	0.63	-0.03	-0.08

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
[a] Rotation converged in 10 iterations
Shaded figures indicate factor loading > 0.3

5.4.3.5.5 Stage 2: Second 18 Item Factor Solution (P2-B)

The factor analysis on the remaining 18 item pool was performed using the Principal Factor Analysis extraction method and Oblimin rotation with Kaiser Normalization. A three factor solution was requested which accounted for 37.06% of the total variance (Table 5.7). Within the reproduced correlation matrix, 39 (25.0%) of the non-redundant residuals exceeded 0.05 and the Kaiser-Meyer-Olkin Measure Sampling Adequacy coefficient equalled 0.80.

Table 5.7 Study Two: Total Variance Explained by Second 18 Item Factor Solution (P2-B)

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Factor	Total	% of Variance	Cumulative %	Total
1	3.15	17.50	17.50	2.81
2	2.53	14.05	31.55	2.49
3	0.99	5.52	37.06	2.37

The underlying dimensions represented by each factor was interpreted using the content of items with significant (>0.3) factor loadings (Table 5.8). Factor one is interpreted as the Social and Aesthetic Benefits of Weight Control (SABen) domain, factor two as the Costs of and Barriers to Weight Control (Costs) domain and factor three as the Health Benefits of Weight Control (HBen) domain.

All items loaded significantly (>0.3) and exclusively on a factor which represented an appropriate domain (Table 5.8). Three items which failed to load > 0.4 on a factor which represented an appropriate domain (items 2, 30 and 38) were, however, removed from the item pool.

Table 5.8 Study Two: Second 18 Item Factor Analysis (P2-B) Pattern Matrix[a]

		Factor	
	1	2	3
Health Benefits of Weight Control (HBen)			
21. An obese person needs more medical care.	0.16	-0.02	-0.45
36. People should maintain an ideal bodyweight for optimal health.	-0.2	0.13	-0.66
37. Losing weight would greatly improve obese people's health.	-0.02	-0.02	-0.72
43. A person with an ideal bodyweight can lead a more active life.	-0.10	-0.05	-0.75
Social and Aesthetic Benefits of Weight Control (SABen)			
2. An ideal bodyweight is more socially acceptable.	0.32	-0.03	-0.22
5. People with an ideal bodyweight are taken more seriously.	0.47	-0.03	-0.02
8. Very overweight people are considered less attractive.	0.70	-0.02	0.05
10. Obese people are embarrassed by the way they look.	0.55	-0.13	-0.01
13. Obese people would be treated better if they lost weight.	0.75	0.01	0.04
17. Obese people would have a better social life if they lost weight.	0.65	0.13	0.01
38. Very overweight people have poorer job prospects.	0.39	0.03	-0.13
Costs of and Barriers to Weight Control (Costs)			
7. Maintaining an ideal bodyweight is boring.	-0.15	0.55	-0.04
15. Maintaining an ideal bodyweight takes a lot of effort.	0.07	0.62	0.02
19. People have to deny themselves a great deal to avoid obesity.	-0.04	0.52	0.07
24. Maintaining an ideal bodyweight makes life less fun.	-0.10	0.76	-0.09
27. A person who avoids obesity has a restricted lifestyle.	0.11	0.55	0.05
30. Losing weight affects an obese person's identity.	-0.05	0.36	-0.03
40. Maintaining an ideal bodyweight is expensive.	0.12	0.64	-0.06

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
[a] Rotation converged in 5 iterations
Shaded figures represent factor loading > 0.3

5.4.3.5.6 Stage 3: Final 15 Item Factor Solution (P2-C)

The factor analysis on the remaining 15 item pool was performed using the Principal Factor Analysis extraction method and Oblimin rotation with Kaiser Normalization. A three factor solution was requested which accounted for 40.68% of the total variance (Table 5.9). Within the reproduced correlation matrix, 19 (18.0%) of the non-redundant residuals exceeded 0.05 and the Kaiser-Meyer-Olkin Measure Sampling Adequacy coefficient equalled 0.79.

Table 5.9 Study Two: Total Variance Explained by Final 15 Item Factor Solution (P2-C)

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Factor	Total	% of Variance	Cumulative %	Total
1	2.72	18.14	18.14	2.37
2	2.40	15.97	34.12	2.34
3	0.99	6.56	40.68	2.16

All items loaded significantly (>0.4) and exclusively on a factor which represented an appropriate domain (Table 5.10).

Table 5.10 Study Two: Final 15 Item Factor Analysis (P2-C) Pattern Matrix[a]

		Factor	
	1	**2**	**3**
Health Benefits of Weight Control (HBen)			
21. An obese person needs more medical care.	0.15	-0.02	-0.46
36. People should maintain an ideal bodyweight for optimal health.	-0.03	0.12	-0.66
37. Losing weight would greatly improve obese people's health.	-0.03	-0.03	-0.73
43. A person with an ideal bodyweight can lead a more active life.	-0.10	-0.06	-0.75
Social and Aesthetic Benefits of Weight Control (SABen)			
5. People with an ideal bodyweight are taken more seriously.	0.43	-0.01	-0.03
8. Very overweight people are considered less attractive.	0.72	-0.01	0.02
10. Obese people are embarrassed by the way they look.	0.56	-0.13	-0.04
13. Obese people would be treated better if they lost weight.	0.69	0.00	0.00
17. Obese people would have a better social life if they lost weight.	0.66	0.14	-0.03
Costs of and Barriers to Weight Control (Costs)			
7. Maintaining an ideal bodyweight is boring.	-0.17	0.54	-0.04
15. Maintaining an ideal bodyweight takes a lot of effort.	0.06	0.62	0.01
19. People have to deny themselves a great deal to avoid obesity.	-0.05	0.54	0.07
24. Maintaining an ideal bodyweight makes life less fun.	-0.12	0.75	-0.09
27. A person who avoids obesity has a restricted lifestyle.	0.08	0.56	0.05
40. Maintaining an ideal bodyweight is expensive.	0.10	0.62	-0.07

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
[a] Rotation converged in 5 iterations
Shaded figures represent factor loading > 0.4

5.4.3.5.7 Stage 4: Outlier Effects Factor Solution (P2-D)

The factor analysis on the remaining 15-item pool performed in Section 5.4.3.5.6 (P2-C) was replicated on data from the sample of individuals with no missing data and no univariate or multivariate outliers (n=175). Principal Factor Analysis extraction method and Oblimin rotation with Kaiser Normalization was used and a three factor solution requested which accounted for 38.83% of the total variance (Table 5.11). Within the reproduced correlation matrix, 27 (25.0%) of the non-redundant residuals exceeded 0.05 and the Kaiser-Meyer-Olkin Measure Sampling Adequacy coefficient equalled 0.76.

Table 5.11 Study Two: Total Variance Explained by Factor Solution P2-D

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Factor	Total	% of Variance	Cumulative %	Total
1	2.72	18.15	18.15	2.54
2	2.16	14.42	32.57	1.98
3	0.94	6.26	38.83	1.96

All items loaded significantly (>0.4) and exclusively on a factor which represented an appropriate domain (Table 5.12), and were retained in the Obesity Outcome Expectancy Belief Scale (ObEx-15).

5.4.3.6 Reliability

5.4.3.6.1 Internal Consistency

Each of the three subscales produced Cronbach's Alpha Coefficients ≥ 0.7, values which were not improved by the removal of any item (Table 5.13). In the sample of 175 cases with no missing data and no significant univariate or multivariate outliers, Cronbach's Alpha Coefficients were enhanced for the Costs of and Barriers to Weight Control (Costs) Subscale, but slightly degraded for the Health Benefits of Weight Control (HBen) and the Social and Aesthetic Benefits of Weight Control (SABen) Subscales, although they all remained significant (≥ 0.7).

Table 5.12 Study Two: Factor Analysis P2-D Pattern Matrix[a]

		Factor	
	1	2	3
Health Benefits of Weight Control (HBen)			
21. An obese person needs more medical care.	-0.02	0.17	-0.43
36. People should maintain an ideal bodyweight for optimal health.	0.10	-0.04	-0.66
37. Losing weight would greatly improve obese people's health.	0.01	-0.05	-0.63
43. A person with an ideal bodyweight can lead a more active life.	-0.04	-0.02	-0.71
Social and Aesthetic Benefits of Weight Control (SABen)			
5. People with an ideal bodyweight are taken more seriously.	0.02	0.44	0.00
8. Very overweight people are considered less attractive.	0.02	0.71	0.09
10. Obese people are embarrassed by the way they look.	-0.14	0.53	-0.05
13. Obese people would be treated better if they lost weight.	-0.04	0.61	-0.03
17. Obese people would have a better social life if they lost weight.	0.11	0.61	-0.04
Costs of and Barriers to Weight Control (Costs)			
7. Maintaining an ideal bodyweight is boring.	0.55	-0.16	-0.05
15. Maintaining an ideal bodyweight takes a lot of effort.	0.63	0.07	0.00
19. People have to deny themselves a great deal to avoid obesity.	0.58	-0.03	0.11
24. Maintaining an ideal bodyweight makes life less fun.	0.81	-0.03	-0.06
27. A person who avoids obesity has a restricted lifestyle.	0.54	0.04	0.01
40. Maintaining an ideal bodyweight is expensive.	0.58	0.08	-0.15

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
[a] Rotation converged in 5 iterations
Shaded figures represent factor loading > 0.4

5.4.3.6.2 Test Retest Reliability

Of the 75 participants who completed the 15 items that form the ObEx-15 scale, again after a period of 3 months, two cases had missing values and were deleted from the data set, resulting in a sample size of 73 and a useable response rate of 79.3%. The Social & Aesthetic Benefits of Weight Control Subscale, Barriers to Weight Control Subscale and the ObEx-15 scale produced an Intraclass Correlation Coefficients ≥ 0.7 (Table 5.14). The Health Benefits of Weight Control Subscale, however, produced an Intraclass Correlation Coefficient of 0.65.

Table 5.13 Study Two: ObEx-15 Scale Internal Consistency Statistics

	Corrected Item-Total Correlation	**Alpha if deleted**
Health Benefits of Weight Control (HBen)		
21. An obese person needs more medical care.	0.45	0.74
36. People should maintain an ideal bodyweight for optimal health.	0.53	0.69
37. Losing weight would greatly improve obese people's health.	0.60	0.65
43. A person with an ideal bodyweight can lead a more active life.	0.59	0.66
	Cronbach's Alpha Coefficient = 0.75	
Social and Aesthetic Benefits of Weight Control (SABen)		
5. People with an ideal bodyweight are taken more seriously.	0.40	0.75
13. Obese people would be treated better if they lost weight.	0.60	0.68
17. Obese people would have a better social life if they lost weight.	0.54	0.70
8. Very overweight people are considered less attractive.	0.57	0.68
10. Obese people are embarrassed by the way they look.	0.50	0.71
	Cronbach's Alpha Coefficient = 0.75	
Costs of and Barriers to Weight Control (Costs)		
7. Maintaining an ideal bodyweight is boring.	0.48	0.75
15. Maintaining an ideal bodyweight takes a lot of effort.	0.53	0.73
19. People have to deny themselves a great deal to avoid obesity.	0.47	0.75
24. Maintaining an ideal bodyweight makes life less fun.	0.65	0.70
27. A person who avoids obesity has a restricted lifestyle.	0.46	0.75
40. Maintaining an ideal bodyweight is expensive.	0.51	0.74
	Cronbach's Alpha Coefficient = 0.77	

Table 5.14 Study Two: ObEx-15 Scale Test Retest Reliability Statistics

	Intraclass Correlation Coefficient*
Health Benefits of Weight Control	0.65
Social & Aesthetic Benefits of Weight Control	0.87
Costs of and Barriers to Weight Control	0.87
Total Scale	0.80

** Two-way random effects model (consistency definition)*

5.4.3.7 Readability

The items included in the ObEx-15 scale were written in language suitable for individuals aged 12 - 13 years and above (Flesch-Kincaid Reading Grade [82] of 7.5; UK equivalent = Year 8 - 9). Omitting the term 'obesity' from the analysis produces a Flesch-Kincaid Grade Level of 7.1 (UK equivalent = Year 8 – 9; ages 12 years and above).

5.4.3.8 Obesity Outcome Expectancy Belief Scale (ObEx-15) Scores

5.4.3.8.1 ObEx-15 Scale Score Distributions

In order to investigate the distribution of score on the three proposed subscales and the total ObEx-15 scale, descriptive statistics (Table 5.15) and histograms were calculated for the sample of 188 cases (Figure 5.2 a) – d)).

5.4.3.8.2 ObEx-15 Scale Score Univariate Associations

The 188 cases used to develop the ObEx-15 scale were investigated with appropriate parametric or non-parametric statistics to investigate the relationships between ObEx-15 scale scores and seven sociodemographic characteristics; gender (male vs. female), age, marital status (married/co-habiting vs. not married/cohabiting), socioeconomic status (Blue Collar vs. White Collar), ethnicity (White European vs. Non-white European), education level (higher (i.e. BTEC/A-level/Scottish Higher or equivalent) vs. no higher qualification), self-reported BMI (kg/m^2).

In univariate correlation analysis, ObEx-15 scale scores were highly associated with lower self-reported BMI ($r = -0.323$; $n = 185$, $p < 0.001$), although no significant correlation was observed between ObEx-15 scale scores and age ($r_s = -0.012$; $n = 188$, $p > 0.05$). Among the dichotomous sociodemographic variables, individuals with lower (i.e. Blue Collar) socioeconomic status attained significantly higher scores on the ObEx-15 scale than individuals with higher (i.e. White Collar) ($Z = -2.623$; $p < 0.01$). However, no significant differences were found in ObEx-15 scale scores between males and females ($t(185) = 0.006$; $p>0.05$), those participants who were married/cohabiting compared to those not married/cohabiting ($t(183) = 1.784$; $p>0.05$) or between those who had received some higher education qualification compared to those who had not ($Z = -1.659$; $p>0.05$). While no significant difference was observed between participants classified as Non-White Europeans compared with White Europeans ($t(1185) = 0.191$; $p>0.05$), this finding is to be treated with caution in light of the small proportion of Non-White European respondents (n=10, 5.35%).

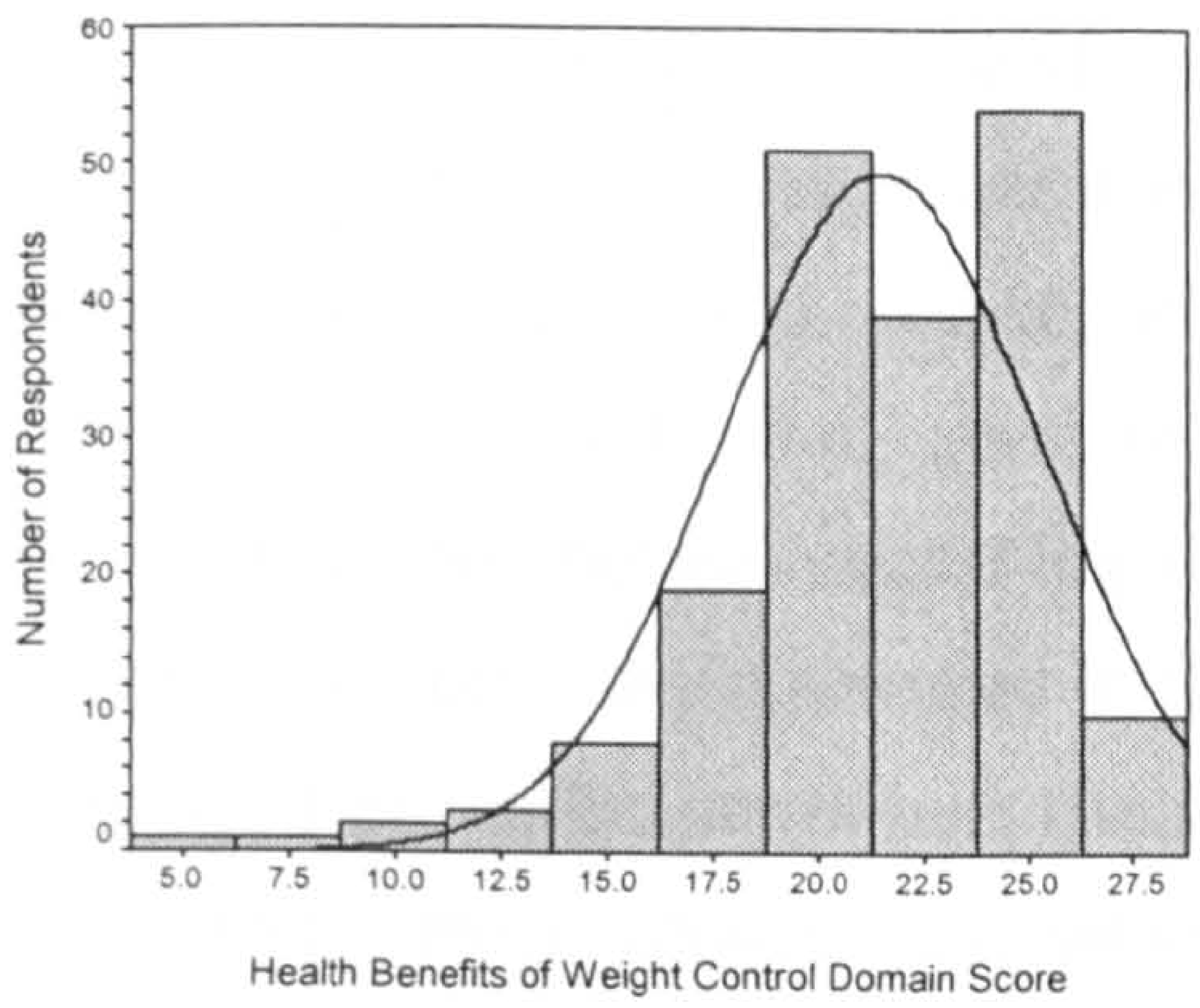
Table 5.15 Study Two: ObEx-15 Scale Score Distribution Statistics

		Possible Range	Mean	SD	Min-Max	Median	Inter-quartile Range
Subscales	Health Benefits of Weight Control	4 - 28	21.57	3.79	4 - 28	22.0	4.0
	Social & Aesthetic Benefits of Weight Control	5 - 35	23.32	5.08	5 - 35	24.0	5.75
	Costs of and Barriers to Weight Control	6 - 42	26.93	6.75	6 - 40	27.0	10.0
ObEx-15 Scale		15 - 105	71.72	9.81	48 - 99	-	-

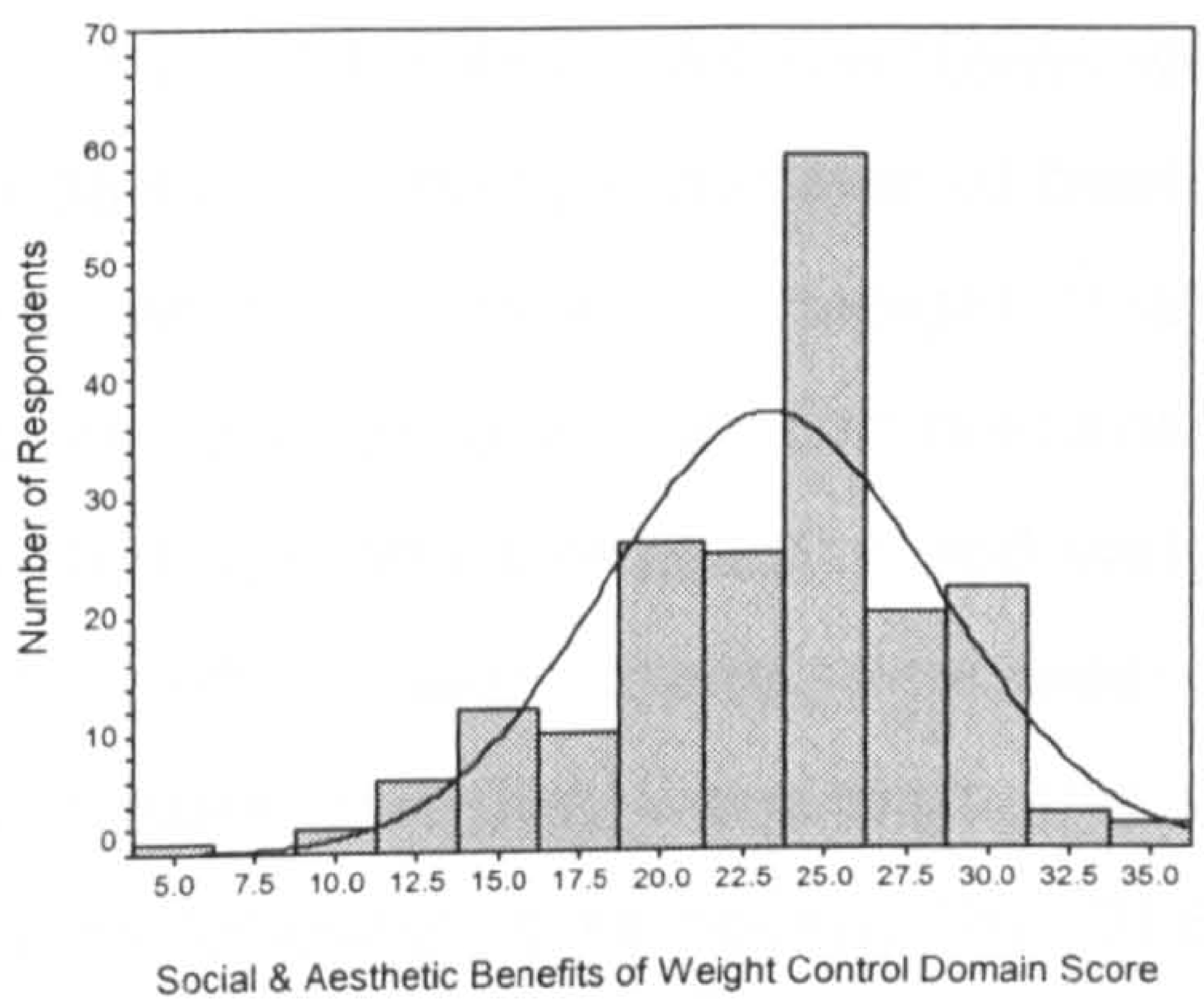
N.B. Median and Interquartile Range reported for distributions with non-Gaussian distributions only

Figure 5.2 Study Two: Obesity Outcome Expectancy Belief Scale Scores

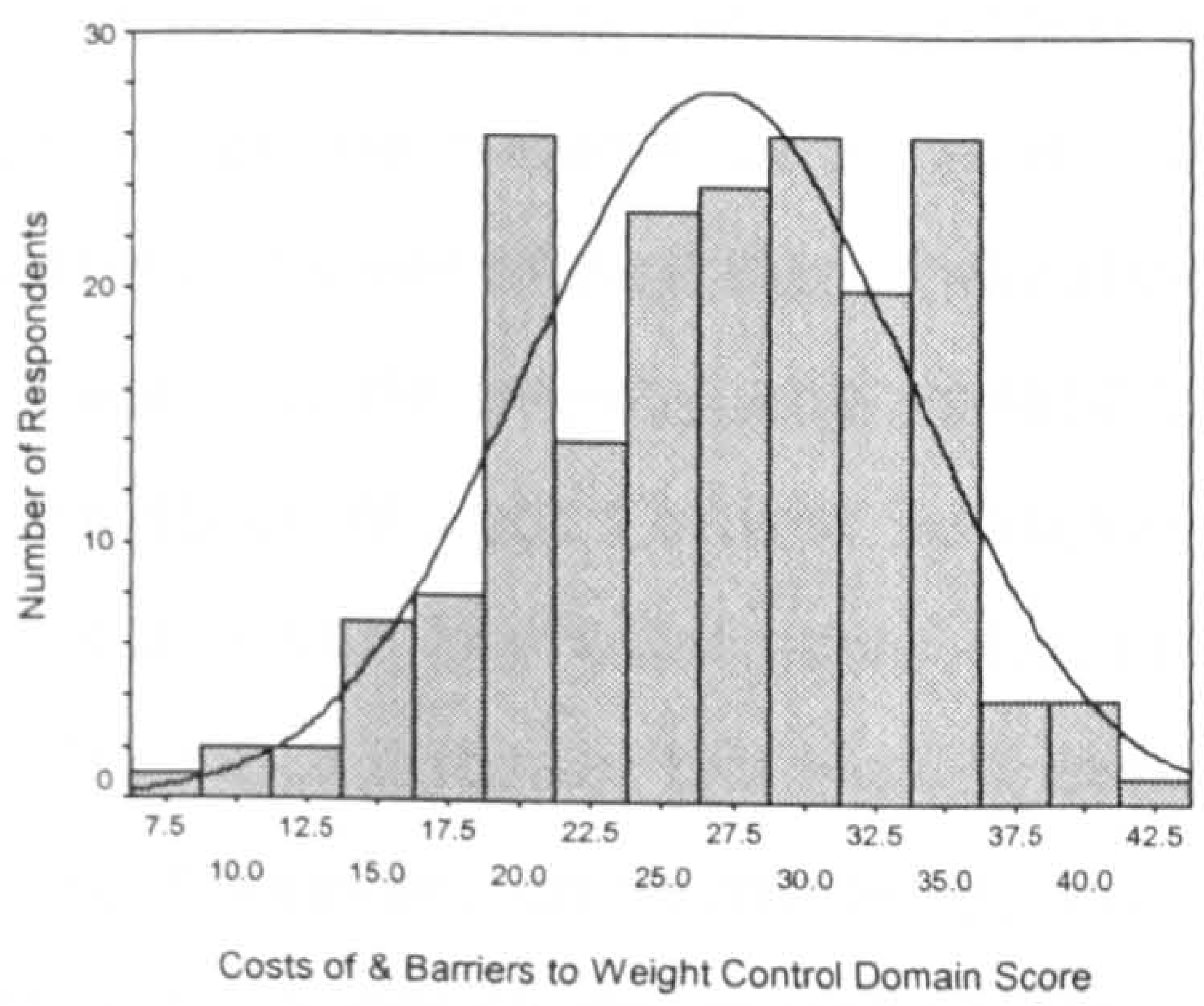
a) Health Benefits of Weight Control Subscale Scores



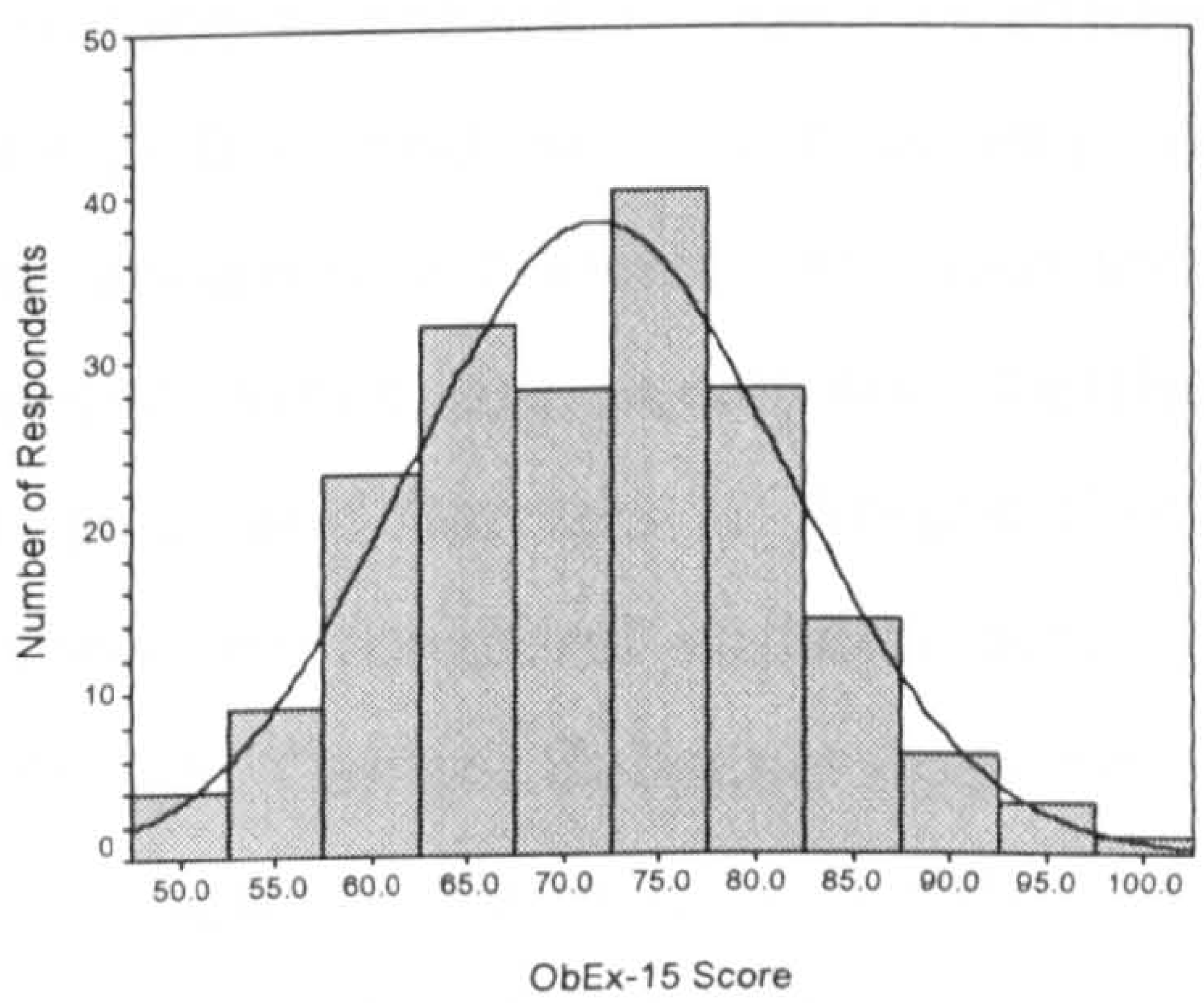
b) Social & Aesthetic Benefits of Weight Control Subscale Scores



c) Costs of & Barriers to Weight Control Subscale Scores



d) ObEx-15 Scale Scores



5.4.4 STUDY TWO DISCUSSION

5.4.4.1 ObEx-15 Scale Psychometric Properties

The factor analyses used in this study ensured that the resultant ObEx-15 scale was composed of a series of unidimensional subscales. However, although factor analysis is used as the main method of constructing the ObEx-15 scale, the item pool was subjected to an initial item analysis prior to the factor analyses. This item analysis allowed 14 inadequate items to be removed from the item pool and, therefore, improved the ratio of cases per item from 4.7 to 7.2 for the sample of 188 cases and from 4.4 to 6.8 for the sample of 176 cases with no missing data and no univariate or multivariate outliers.

Based upon the items' content, the three unidimensional subscales produced were labelled Health Benefits of Weight Control, Social & Aesthetic Benefits of Weight Control, and Costs of and Barriers to Weight Control. As the items were developed from a rigorous qualitative investigation involving a number of healthy weight, overweight and obese individuals with a range of weight-related intentions, it is likely that they represent an appropriate and comprehensive sample of salient beliefs regarding the expected outcomes of obesity and weight control behaviour. As discussed in Section 5.3, efforts were made to incorporate terms used by participants into the items to ensure that they were engaging and meaningful. More objectively, when the term 'obesity' is removed, the ObEx-15's readability estimate suggests that it is written in language suitable for the UK population.

All three subscales, and the total scale, produce Cronbach's Alpha coefficients that meet the criteria for internal consistency (≥ 0.7) and would not be improved by the removal of any item indicating that an acceptable balance has been struck between scale brevity and reliability. However, while the Social and Aesthetic Benefits of Weight Control Subscale, the Costs of and Barriers to Weight Control Subscale and the total scale demonstrate adequate temporal stability according to the ≥ 0.7 criteria, the Health Benefits of Weight Control Subscale does not. It does, however, conform to Bowling's less stringent criteria of 0.5 [90]. It is difficult to conclude whether HBen scores genuinely changed between tests following exposure to, for example, a relevant health education campaign, or whether the construct is temporally unstable. In addition, care has to be taken when considering the test-retest reliability coefficients from all subscales, as the sample size from which they were determined falls short of the recommended minimum of 100 cases [78].

Although the ObEx-15 scale and the SABen and Costs subscales produce a good spread of scores with no significant ceiling or floor effects, the HBen subscale demonstrates a moderate ceiling effect. This subscale will, therefore, have a limited capacity to discriminate between individuals with very positive beliefs about the health benefits of weight control. This ceiling effect is due to the use of items exceeding the 0.8 p-value cut-off. Although during the initial item analysis, the traditional criteria of excluding items with item-total correlation coefficients below 0.3 was retained, other items were only excluded if they produced p-values below 0.1 or exceeding 0.9. This alternative criterion was selected as many interesting items, particularly from the proposed Health Benefits to Weight Control Subscale, would otherwise have been lost.

In the univariate analyses, it is interesting to observe that ObEx-15 scale scores are negatively correlated with self-reported BMI, i.e. being more positive about weight control is associated with more successful weight control. While this appears to support the hypothesis that beliefs regarding the consequences of obesity will promote weight control behaviour, this must be treated with caution, due to the cross-sectional nature of the data. It is also interesting to observe that individuals with low socioeconomic status scored significantly higher on the ObEx-15 scale, indicating a higher utility for weight control to avoid obesity. This is surprising considering that previous research has demonstrated that low socioeconomic status is significantly associated with negative attitudes and beliefs regarding health [220]. Unfortunately this finding must be interpreted with caution as the univariate analysis offers no control for potentially confounding factors. While the sample size prohibits a more rigorous analysis using multiple regression, they do suggest the need for a more detailed exploration of the ObEx-15 scale scores in Study Three.

5.4.4.2 Factor Analyses

5.4.4.2.1 Stage 1: Initial 27 Item Factor Solution (P2-A)

Although statistical criteria can be useful for determining the number of items to be retained and rotated, eight factors fulfilled the standard statistical criteria (Eigen Values > 1), were produced in the initial 15 item factor analysis (P2-A). Although including these eight factors in the final solution would increase its explanatory power, the aim of the study is to develop a scale assessing a relatively small number of domains. Therefore, a four factor solution was requested to reflect the proposed domains in the item pool; beliefs regarding the health benefits of weight control, beliefs regarding the social benefits of weight control, beliefs regarding the aesthetic/appearance-related benefits of weight control and beliefs regarding the costs of and barriers to weight control. Items were considered to represent useful measures of a dimension if it loaded significantly (i.e.> 0.3) and exclusively on the factor representing that particular dimension.

The proposed domains were not, however, entirely reflected in the resulting factor solution. Although the vast majority of items from the Health Benefits of Weight Control loaded significantly onto one factor (factor 3) exclusively as anticipated, a sizeable number of the Social Benefits of Weight Control and Aesthetic Benefits of Weight Control items clustered together. Although these were originally proposed as separate domains, it is reasonable to assume that these items do, in fact, represent a single domain. The extent to which the obese appearance is considered undesirable is reflected in whether obese people are judged as, for example, unattractive, embarrassing and unkempt, and by the negativity of individuals' reactions and behaviour towards the obese appearance.

There appears to be a certain amount of overlap between the proposed domains as three items from the pooled Social and Aesthetic Benefits of Weight Control domain clusters with items from the Health Benefits of Weight Control domain while one item from the Health Benefits of Weight Control domain loads significantly and exclusively on the Social and Aesthetic Benefits of Weight Control domain.

Item 1 ('Obesity prevents a person from getting the most out of life') was written to assess beliefs regarding the extent to which obesity effects health-related quality of life. However as it is written here, 'quality of life' is a relatively ambiguous concept [221] and so its categorisation in the proposed Health

Benefits of Weight Control domain is questionable. As this item clearly clusters with items reflecting the social and aesthetic issues, it appears that it captures beliefs regarding the impact of social reactions to obesity on quality of life. Although this item achieved the statistical criteria for retention in the Social and Aesthetic Benefits of Weight Control Subscale, it was dropped from further analyses as it was considered to be inadequately phrased.

The unexpected association of items 20, 23 and 33 ('To look good it is important to maintain an ideal bodyweight', 'It is harder for an obese person to look smart and efficient' and 'Losing weight improves an obese person's appearance', respectively) which were originally included in the proposed Social and Aesthetic Benefits of Weight Control Subscale, with the items from the Health Benefits of Weight Control domain, cannot be easily explained through inspection of the item content. Out of these three items, item 33 alone achieves the statistical criteria for retention in the Health Benefits of Weight Control Subscale, but is dropped from further analyses as it, once again, was considered to be semantically ambiguous.

In contrast to the items from the proposed Social and Aesthetic Benefits of Weight Control domains which clustered together, the vast majority of items from the Costs of and Barriers to Weight Control domain produced two clusters. The smaller of the two clusters is produced by the three items, two of which were written to assess the health-related barriers to weight control (Items 3 and 32; 'There is very little proof that obesity causes health problems' and 'There is no guarantee that obesity will cause poor health', respectively). These items were originally included with other items assessing non-health barriers to weight control to form a generic domain to assess the disadvantages of engaging in weight control behaviour, but it appears that these may represent separate constructs. These two health-related items and their associated factor were not retained in further analyses as it was probably the least important factor, indicated by the rotation sum of squared loading, and would not have produced a reliable scale.

The larger of the two clusters produced by items from the Costs of and Barriers to Weight Control domain, consist entirely of items regarding the non-health related barriers to weight control. All items loaded significantly and, with the exception of item 19 ('People deny themselves a great deal to avoid obesity'), exclusively on their respective factor. Despite the failure of item nineteen to cluster exclusively with the non-health related barriers to weight control, it was retained in further analyses. As the health related barriers to weight control domain was removed from further analysis, item 19 was considered to represent an adequately pure measure of non-health related barriers.

Although the resulting four factor solution accounted for 35.52% of the variance seen in the original variables, 26.0% of the non-redundant residuals had correlations exceeding 0.05, which is somewhat higher than the ambiguous maximum of 'several', suggested as indicating an adequate factor solution [91]. The doubtful ability of the factor solution to adequately summarise the variance seen in the original variables is, however, to be expected before the removal of all the ineffective items from the item pool and so the analysis was repeated on the reduced pool.

5.4.4.2.2 Stage 2: Second 18 Item Factor Solution (P2-B)

In addition to the removal of the 7 items which failed to meet the statistical criteria, item 34 ('People who try to maintain an ideal bodyweight are boring'), was also removed as it had a very similar content to item 7 ('Maintaining an ideal bodyweight is boring') which had a higher factor loading and was, therefore, considered to represent a purer measure of the Costs and Barriers domain. Although five factors fulfilled the standard statistical criteria (Eigen Values > 1), a three factor solution was requested to reflect the removal of the three health-related barriers items and the merger of the Social and Aesthetic Benefits domains. Once again, items were considered to represent useful measures of a dimension if they loaded significantly (i.e.> 0.3) and exclusively (i.e. ≤ 0.3 on all other items) on the factor representing that particular dimension.

With the removal of the nine items used in the initial 26 item pool which did not meet the statistical criteria, the three proposed domains were reflected in the resulting factor solution with roughly equal significance.

The removal of the eight items identified in the initial 26 item factor analysis (P2-A) and the request for three factors improved the amount of variance explained by the factor solution from 35.52% to 37.06%, while reducing the number of non-redundant residuals with correlations exceeding 0.05 from 26.0% to 25.0%. In an attempt to improve the ability of the factor solution to adequately summarise the variance seen in the original variables, and to minimise length of the scale, the three items (item 2: 'An ideal bodyweight is more socially acceptable', item 30: 'Losing weight affects an obese person's identity' and item 38: 'Very overweight people have poorer job prospects') which represented the weakest measures (loadings < 0.45) were removed from the item pool and a final 15 item factor analysis was run (P2-C).

5.4.4.2.3 Stage 3: Final 15 Item Factor Solution (P2-C)

Despite the removal of items 2, 30 and 38 from the item pool, the three proposed domains continued to be reflected in the resulting factor solution with roughly equal significance.

All items load highly (>0.4) and exclusively on their designated factor, so that no further items are highlighted for removal. The final factor solution accounted for 40.68% of the total variance, although the number of non-redundant residuals with correlations exceeding 0.05 remains somewhat higher (18.0%) than the ambiguous maximum of 'several' suggested by Tabachnick and Fidell [91]. This suggests that these 15 items represent relatively pure measures of three important dimensions which can be interpreted as Health Benefits of Weight Control, Social and Aesthetic Benefits of Weight Control and Costs of and Barriers to Weight Control.

5.4.4.2.4 Stage 4: Outlier Effects Factor Solution (P2-D)

In the sample of 176 cases with no missing data and no significant univariate and multivariate outliers, all items continued to load significantly (>0.4) and exclusively on their appropriate domains, and no further items were highlighted for removal. The adequacy of the solution is slightly degraded which suggests that the cases identified as significant univariate and/or multivariate outliers appear to have a small, positive effect on the resulting factor solution. The factor structure also alters with the Costs of and Barriers to Weight Control domain taking over from the Social and Aesthetic Benefits of Weight Control domain as the most important factor (Rotation Sum of Squared Loading = 2.54). This seems to suggest that the items are relatively purer measures of the Costs of and Barriers to Weight Control domain in cases identified as significant univariate and/or multivariate outliers. Although the outlier cases do influence the factor solution, the three proposed domains are convincingly maintained.

5.4.4.3 Study Strengths & Limitations

5.4.4.3.1 Response Rate

The data collection methods employed in Study Two produced a reasonable response rate (46.5%) considering that no incentives were offered, there was no opportunity to complete the questionnaires immediately after distribution and data collection relied upon the participants' mailing their responses back. Although reasonable and comparable with other studies (e.g. Obesity Risk Knowledge Scale Development Study One), the response rate attained has important implications for data analysis and interpretation.

As previously discussed in Chapter Four, it is clear that it is the minority of individuals approached who were sufficiently motivated to complete the questionnaire, and that participants may have different beliefs compared with non-respondents. However, once again, data collection is anonymous and so the extent to which non-respondents differ to participant is unknown.

5.4.4.3.2 Sample Size

As there were very few missing values for any item, they were not considered to represent significant source of bias, and so cases with missing data were deleted from the data set [91]. This procedure resulted in the deletion of fifteen cases which did not significantly alter the adequacy of the sample size (n = 188) used in the statistical analyses.

One hundred and eighty-eight responses comfortably exceeds the recommended minimum for an item analysis of 100 cases [78]. As the initial item analysis removed thirteen items from the item pool, this sample size also easily exceeds 3 cases per variable as recommended by Kline [78] and approaches the sample size of 200 recommended by Comfrey [93]. It is, however, considered to be inadequate when compared with the more stringent standard of 300 cases recommended by Tabachnick and Fidell [91]. Although the sample size attained could be considered inadequate when compared to some, although not all, criteria, the replicability and reliability of the resulting factor solution is to be investigated in a large sample of new participants in Study Three.

Within the sample of 188 responses with no missing data, a number of univariate and multivariate outlier cases were observed which were not eliminated by data transformation procedures. As deletion of these cases had a large impact on the resulting sample size (n = 176), the decision was made to retain these cases in the initial analysis, but then to repeat the analysis with these cases removed to observe their impact, as suggested by Tabachnick and Fidell [91]. In this way, larger sample sizes could be maintained if the cases had little impact on the analysis.

5.4.4.3.3 Sample Representativeness

To ensure that the Obesity Outcome Expectancy Belief Scale can be used as a generic instrument, it is desirable that the samples used for its development are representative of the UK adult population. Sampling was, however, opportunistic rather than stratified which has resulted in a significant difference between the sample obtained in Study Two and the UK population, particularly in terms of employment status. Although the sample can be criticised in terms of its representativeness of the UK population, the sample can be considered to be adequate for developmental purposes. The samples are reasonably heterogeneous and provide enough variance in scores to allow factors to emerge. It is clear, however, that the scale's full utility will only be revealed in future research, for example with the long-term unemployed and ethnic minority populations.

Although several authors of test construction methodology recommend that scales are developed using separate samples that are homogeneous for criteria such as gender [78, 91], analysis was carried out on a sample heterogenous for several potentially influential factors including socioeconomic status, education level, age, and gender. To achieve a sample that is homogeneous for all potentially influencing criteria would involve huge resources with no guarantee that the criteria would, in fact, affect the factor solution. In addition, univariate statistics reveal that the majority of sociodemographic factors have no effect on ObEx-15 scale scores. Socioeconomic status did, however, significantly correlate suggesting that further research would be required to ensure that the ObEx-15 scale is unidimensional in different socioeconomic subgroups of the population.

5.4.4.3.4 Item Analysis

In addition to the p-value cut-offs of 0.1 and 0.9, items were also excluded upon the basis that the proportion of neutral responses exceeded 35%. Although this arbitrary cut-off is not described as part of a traditional item analysis, this was considered to be important to ensure that the items were discriminatory.

In addition to the items removed due to inadequate psychometric properties, three items were removed due to semantic differentials and participant feedback. Although intuitive criteria is not traditionally part of item analysis, it does take into account the test constructor's subjectivity.

5.4.4.3.5 Factor Analysis

To ensure that the factor analyses were carried out on a suitable data set, the 26 items retained following the initial item analysis were assessed in terms of multivariate normality (i.e. univariate normality, linearity, and homoscedasticity) and multicollinearity. Although multicollinearity was not present in either data set, the variables failed the criteria for multivariate normality, even when the data was subjected to a square root transformation. However, multivariate normality is not an essential feature of multivariate analysis [91].

All four factor analyses were conducted using the Principal Factor Analysis (PFA) extraction method and Oblimin rotation with Kaiser Normalization. PFA was preferred to Principal Components Analysis (PCA) as the aim of the analysis was to identify and summarise underlying dimensions that cause the association between the variables in the correlation matrix, rather than to describe how the variables group together. Oblique rotation was selected instead of orthogonal rotation to improve the interpretability of the extracted factors as there is no compelling reason to assume that the factors, are uncorrelated [78].

Factor analysis was considered to be an appropriate statistical procedure for this data set, as all the correlation matrices produced contained an adequate number of substantial correlations measured by the Kaiser-Myer-Olkin measure of sampling adequacy value, and were, therefore, factorable.

5.4.5 STUDY TWO CONCLUSION

This study has produced a short scale with which to assess obesity outcome expectancies, suitable for the individuals aged 12 and over. The ObEx-15 scale appears to be reliable and comprised of three unidimensional domains. However, to firmly establish the scale's psychometric properties, further research on new samples of participants is required.

5.5 STUDY THREE: CONFIRMATION OF PSYCHOMETRIC PROPERTIES

5.5.1 STUDY THREE AIMS

1. To investigate the extent to which the psychometric properties produced by the Obesity Outcome Expectancy Belief Scale (ObEx-15) in Study Two are replicated in a larger, more diverse sample.

2. To investigate ObEx-15 scale scores and their relationship with sociodemographic factors, self-reported Body Mass Index and health value.

5.5.2 STUDY THREE METHOD

5.5.2.1 Study Design

A cross-sectional survey.

5.5.2.2 Sampling

5.5.2.2.1 Sample A

An opportunistic sample of staff members at John Lewis Solihull as outlined in Section 4.5.2.2.1.

5.5.2.2.2 Sample B

An opportunistic sample staff members at DHL Aviation (UK) Ltd as outlined in Section 4.5.2.2.2.

5.5.2.3 Measures

5.5.2.3.1 Obesity Outcome Expectancy Belief Scale (ObEx-15)

The Obesity Outcome Expectancy Belief Scale (ObEx-15) is a 15-item scale assessing beliefs regarding the costs and benefits of weight control behaviour produced by the initial scale development conducted in Study One.

5.5.2.3.2 Obesity Risk Knowledge Scale (ORKS-10)

The Obesity Risk Knowledge Scale (ORKS-10) is a reliable, discriminant and valid 10-item scale assessing knowledge regarding the effects of obesity on health suitable for individuals aged 12 and over (see Section 4.5.2.3.1 for further details).

5.5.2.3.3 Sociodemographic Characteristics

A series of structured questions were used to obtain details of age, gender, marital status, ethnicity and level of education. Occupation was obtained using a free response question and status coded using the National Statistics Socio-economic Classification [205]. Respondents also recorded their current height and weight from which self-reported Body Mass Index (kg/m^2) was calculated.

5.5.2.3.4 Health as a Value Scale

The Health Value Scale is a reliable and valid four item scale which has been developed by Lau, Hartman and Ware to provide a general measure of health value suitable for individuals aged 6 and over [222]. Participants are asked to respond to four items using a 7-point Likert scale response format. The two items 'Good health is only of minor importance in a happy life' and 'There are many things I care about more than my health' are scored as 'strongly agree' = 1, to 'strongly disagree' = 7. The two items 'There is nothing more important than good health' and 'If you don't have your health, you don't have anything' are scored in the reverse direction with 'strongly agree' = 7 and 'strongly disagree' = 1. Scores from the total scale are summed to produce a range between 4 and 28 with higher average health value scores indicating a higher value being placed on health.

5.5.2.4 Procedures

5.5.2.4.1 Data Collection

As outlined in Section 4.5.2.4.1.

5.5.2.4.2 Data Analysis

All data analyses were conducted using SPSS (Version 11.5). Factor analysis was used to determine whether the factor loadings achieved in Study Two were replicated in this more diverse sample. The subscales were assessed in terms of their internal consistency using Cronbach's Alpha Coefficient to determine whether they retained their reliability. Scores achieved on the Obesity Outcome Expectancy Belief Scale (ObEx-15) were also investigated using descriptive, univariate and multivariate statistics.

5.5.2.5 Ethical Considerations

This study received approval from the Nottingham University Medical School Ethics Committee (Appendix Three). Participants were considered to have consented to taking part in the study if they completed and returned a questionnaire.

5.5.3 STUDY THREE RESULTS

5.5.3.1 Response Rate

Of the 479 invitation packs distributed to Sample A, 186 responses were received resulting in a sample response rate of 38.8%. Of the 900 invitation packs distributed to Sample B, 134 responses were received resulting in a sample response rate of 14.9% and an overall response rate of 24.1%.

5.5.3.2 Data Screening

5.5.3.2.1 Descriptive Statistics

Descriptive statistics for all items were inspected and were found to have no out-of-range values and reasonable means and standard deviations (Table 5.16).

Table 5.16 Study Three: ObEx-15 Scale Item Descriptive Statistics

Item		Mean	SD	Range
Health Benefits of Weight Control				
1	An obese person needs more medical care.	5.41	1.43	1 - 7
6	People should maintain an ideal bodyweight for optimal health.	5.77	0.99	1 - 7
11	Losing weight would greatly improve obese people's health.	6.04	1.06	1 - 7
15	A person with an ideal bodyweight can lead a more active life.	5.58	1.24	2 - 7
Social & Aesthetic Benefits of Weight Control				
7	Obese people would be treated better if they lost weight.	4.68	1.60	1 - 7
10	People with an ideal bodyweight are taken more seriously.	4.08	1.71	1 - 7
14	Obese people would have a better social life if they lost weight.	4.30	1.62	1 - 7
17	Very overweight people are considered less attractive.	5.15	1.68	1 - 7
22	Obese people are embarrassed by the way they look.	4.50	1.45	1 - 7
Costs of and Barriers to Weight Control				
2	People have to deny themselves a great deal to avoid obesity.	4.79	1.64	1 - 7
4	Maintaining an ideal bodyweight is expensive.	5.13	1.74	1 - 7
8	Maintaining an ideal bodyweight is boring.	4.68	1.73	1 - 7
12	Maintaining an ideal bodyweight takes a lot of effort.	3.71	1.71	1 - 7
16	Maintaining an ideal bodyweight makes life less fun.	5.19	1.45	1 - 7
21	A person who avoids obesity has a restricted lifestyle.	5.36	1.53	1 - 7

5.5.3.2.2 Missing Data

The data set was screened for missing values using SPSS Missing Value Analysis. As no item was missing more than seven values (2.19%), t-tests were not requested to investigate whether the missing values were related to any other variable. Eighteen cases with missing values were deleted from the data set resulting in a sample size of 302 and a useable response rate of 22.7%.

5.5.3.2.3 Univariate & Multivariate Outliers

Eight cases with standardized scores in excess of 3.29 ($p < 0.001$, two-tailed test) on one or more of the items. Four of these eight cases along, with eight other cases, displayed a Mahalanobis distance greater than $\chi^2(15) = 37.692$ ($p < 0.001$) and were considered to represent significant multivariate outliers.

5.5.3.2.4 Normality

All variables were found to have significantly skewed distributions (One-Sample Kolmogorov-Smirnov Test; $p < 0.001$) (Table 5.17). When items were reflected as appropriate and subject to square root transformation, no advantage was conferred as skewness was reversed and increased (Table 5.17).

Table 5.17 Study Three: ObEx-15 Scale Item Distribution Statistics

Item	Skewness	Kurtosis	Transformed Skewness	Transformed Kurtosis
Health Benefits of Weight Control				
1	1.27*	1.41	-1.80*	3.40
6	1.18*	2.29	-1.80*	5.83
11	1.76*	4.60	-2.57*	9.84
15	1.19*	1.06	-1.55*	2.21
Social & Aesthetic Benefits of Weight Control				
7	0.58*	-0.42	-1.00*	0.41
10	0.10*	-1.11	-0.43*	-0.88
14	0.25*	-0.98	-0.60*	-0.52
17	0.94*	-0.05	-1.32*	1.01
22	0.26*	-0.60	-0.66*	-0.07
Costs of and Barriers to Weight Control				
2	0.49*	-1.00	-0.76*	-0.45
4	0.88*	-0.29	-1.24*	0.70
8	0.52*	-0.75	-0.91*	0.08
12	-0.20*	-1.15	-0.50*	-0.88
16	0.96*	0.436	-1.45*	2.10
21	1.27*	1.18	-1.79*	3.18

* Significant skewness from normality (One-Sample Kolmogorov-Smirnov Test ($p < 0.001$))

5.5.3.2.5 Linearity & Homoscedasticity

As all variables had non-Gaussian distributions, several bivariate plots involving variables with the most discrepant distributions were inspected for non-linearity and heteroscedasticity; question 11 which had moderate negative skewness, question 12 with moderate positive skewness and question 10 with minimal skewness. The scatterplots' overall shape were not perfectly oval indicating that the variables investigated were not linearly related, although there was no evidence of curvilinearity. Heteroscedasticity was also evident as there was a greater variability of scores on item 10 and 12 for high than low values of item 11.

5.5.3.3 Respondents' Characteristics

Within the sample of 302 useable responses, participants ranged in age from 17.19 to 65.19 years (n = 290, mean = 38.12 years, s.d = 11.85 years). The majority of this sample were female (n = 168, 55.6%), married / co-habiting (n = 184, 60.9%), White British / European (n = 282, 93.4%) and had not received a higher education qualification (n = 146, 48.7%). All three socio-economic classes were represented, with the majority of participants having routine and manual occupations (n = 110, 36.4%), followed by managerial and professional occupations (n = 92, 30.5%) and intermediate occupations (n = 59, 19.5%). The majority of participants were within the Body Mass Index (BMI) range of 18.5 - 25 kg/m^2 (n = 149, 49.3%) although a significant proportion exceeded the recommended BMI of 25 kg/m^2 (n = 134, 44.4%). Participants Health as a Value scores produced a negatively skewed distribution with a median score of 20.0 (interquartile range = 7.0) out of a possible range between 4 and 28 points.

5.5.3.4 Factor Analysis

5.5.3.4.1 Initial ObEx-15 Scale Factor Solution (P3-A)

The factor analysis was performed using the Principal Factor Analysis extraction method and Oblimin rotation with Kaiser Normalization. A three factor solution was requested which accounted for 36.31% of the total variance (Table 5.18). Within the reproduced correlation matrix, 21 (20.0%) of the non-redundant residuals exceeded 0.05 and the Kaiser-Meyer-Olkin Measure Sampling Adequacy coefficient equalled 0.796.

Table 5.18 Study Three: Total Variance Explained by Initial ObEx-15 Scale Factor Solution (P3-A)

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Factor	Total	% of Variance	Cumulative %	Total
1	2.96	19.74	19.74	2.40
2	1.92	12.77	32.51	2.55
3	0.57	3.80	36.31	1.29

Using the content of items with significant (>0.3) factor loadings (Table 5.19), the underlying dimension represented by each factor was inferred. Factor one is interpreted as the general Social and Aesthetic Benefits of Weight Control domain, factor two as the Costs of and Barriers to Weight Control domain, factor three as the Health Benefits of Weight Control domain.

Only one item failed to load significantly (>0.3) and exclusively on its designated factor; item 15 'A person with an ideal bodyweight can lead a more active life' from the Health Benefits of Weight Control Subscale (Table 5.19).

Table 5.19 Study Three: Initial Factor Analysis (P3-A) Pattern Matrix[a]

		Factor		
		1	2	3
Health Benefits of Weight Control (HBen)				
1.	An obese person needs more medical care.	0.05	0.10	0.34
6.	People should maintain an ideal bodyweight for optimal health.	-0.02	-0.06	0.62
11.	Losing weight would greatly improve obese people's health.	0.18	0.02	0.47
15.	A person with an ideal bodyweight can lead a more active life.	0.53	0.04	0.20
Social and Aesthetic Benefits of Weight Control (SABen)				
7.	Obese people would be treated better if they lost weight.	0.55	-0.09	0.04
10.	People with an ideal bodyweight are taken more seriously.	0.43	-0.23	0.11
14.	Obese people would have a better social life if they lost weight.	0.65	-0.02	0.01
17.	Very overweight people are considered less attractive.	0.65	0.11	-0.08
22.	Obese people are embarrassed by the way they look.	0.52	-0.08	0.07
Costs of and Barriers to Weight Control (Costs)				
2.	People have to deny themselves a great deal to avoid obesity.	0.19	0.71	-0.19
4.	Maintaining an ideal bodyweight is expensive.	-0.08	0.65	0.10
8.	Maintaining an ideal bodyweight is boring.	-0.10	0.61	0.08
12.	Maintaining an ideal bodyweight takes a lot of effort.	-0.08	0.63	-0.06
16.	Maintaining an ideal bodyweight makes life less fun.	-0.06	0.65	0.17
21.	A person who avoids obesity has a restricted lifestyle.	0.00	0.44	0.03

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 9 iterations
Shaded figures represent factor loading > 0.3

5.5.3.4.2 Outlier Effects Factor Solution (P3-B)

The factor analysis on the 15 items from the ObEx-15 scale performed in Section 5.5.3.4.1 (P3-A) was replicated on data from the sample of individuals with no missing data and no univariate or multivariate outliers (n=286). The factor analysis was performed using the Principal Factor Analysis extraction method and Oblimin rotation with Kaiser Normalization. A three factor solution was requested which accounted for 39.8% of the total variance (Table 5.20). Within the reproduced correlation matrix, 14 (13.0%) of the non-redundant residuals exceeded 0.05 and the Kaiser-Meyer-Olkin Measure Sampling Adequacy coefficient equalled 0.800.

Table 5.20 Study Three: Total Variance Explained by Factor Solution (P3-B)

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Factor	Total	% of Variance	Cumulative %	Total
1	3.16	21.09	21.09	2.75
2	2.20	14.63	35.72	1.63
3	0.62	4.10	39.82	2.54

Using the content of items with significant (>0.3) factor loadings (Table 5.21), the underlying dimension represented by each factor was inferred. Factor one is interpreted as the Costs of and Barriers to Weight Control domain, factor two as the Health Benefits of Weight Control domain and factor three as the Social and Aesthetic Benefits of Weight Control domain.

Items for the Health Benefits of Weight Control Subscale and the Social and Aesthetic Benefits of Weight Control Subscale are characterised by positive factor loadings on their respective factors, while items from Costs of and Barriers to Weight Control Subscale are characterised by significant negative loadings on factor two (Table 5.21).

Two items failed to load significantly (>0.3) and exclusively on their designated factors; item 1 'An obese person needs more medical care' and item 15 'A person with an ideal bodyweight can lead a more active life', both from the Health Benefits of Weight Control Subscale (Table 5.21).

Table 5.21 Study Three: Factor Analysis P3-B Pattern Matrix[a]

		Factor	
	1	2	3
Health Benefits of Weight Control (HBen)			
1. An obese person needs more medical care.	-0.11	0.25	0.09
6. People should maintain an ideal bodyweight for optimal health.	0.06	0.64	-0.05
11. Losing weight would greatly improve obese people's health.	-0.06	0.68	0.14
15. A person with an ideal bodyweight can lead a more active life.	-0.01	0.31	0.46
Social and Aesthetic Benefits of Weight Control (SABen)			
7. Obese people would be treated better if they lost weight.	0.11	0.08	0.53
10. People with an ideal bodyweight are taken more seriously.	0.22	0.06	0.46
14. Obese people would have a better social life if they lost weight.	0.08	0.08	0.62
17. Very overweight people are considered less attractive.	-0.17	-0.08	0.72
22. Obese people are embarrassed by the way they look.	0.10	0.05	0.52
Costs of and Barriers to Weight Control (Costs)			
2. People have to deny themselves a great deal to avoid obesity.	-0.70	-0.16	0.18
4. Maintaining an ideal bodyweight is expensive.	-0.65	0.08	-0.09
8. Maintaining an ideal bodyweight is boring.	-0.62	0.05	-0.09
12. Maintaining an ideal bodyweight takes a lot of effort.	-0.60	0.00	-0.13
16. Maintaining an ideal bodyweight makes life less fun.	-0.71	0.18	-0.12
21. A person who avoids obesity has a restricted lifestyle.	-0.53	-0.00	0.03

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
[a] Rotation converged in 10 iterations
Shaded figures represent factor loading > 0.3

5.5.3.5 Internal Consistency

In the full sample of 302 cases with no missing data, the Social and Aesthetic Benefits of Weight Control Subscale and the Costs of and Barriers to Weight Control Subscale produced Cronbach's Alpha Coefficients ≥ 0.7 (Table 5.22). The Social and Aesthetic Benefits of Weight Control Subscale's internal consistency was not improved by the removal of any item, although the Costs of and Barriers to Weight Control Subscale's internal consistency would have slightly improved from 0.78 to 0.79 with the removal of item 21 (Table 5.22). The Health Benefits of Weight Control Subscale produced Cronbach's Alpha Coefficients of 0.55 which would have been improved to 0.56 with the removal of item 1 (Table 5.22).

In the sample of 286 cases with no missing data and no significant univariate or multivariate outliers, Cronbach's Alpha Coefficients were enhanced for all three subscales, although the Health Benefits of Weight Control Subscale remained less than 0.7. The Social and Aesthetic Benefits of Weight Control Subscale's and the Costs of and Barriers to Weight Control Subscale's internal consistency would not be improved by the removal of any item although internal consistency of the Health Benefits of Weight Control Subscale would have slightly improved from 0.61 to 0.63 with the removal of item 1 (Table 5.22).

Table 5.22 Study Three: ObEx-15 Scale Internal Consistency Statistics

		Full sample N = 302		**Outliers removed N = 286**	
		Corrected Item-Total Correlation	**Alpha if deleted**	**Corrected Item-Total Correlation**	**Alpha if deleted**
Health Benefits of Weight Control (HBen)					
1	An obese person needs more medical care.	0.23	0.56	0.22	0.63
6	People should maintain an ideal bodyweight for optimal health.	0.40	0.40	0.43	0.46
11	Losing weight would greatly improve obese people's health.	0.39	0.41	0.51	0.41
15	A person with an ideal bodyweight can lead a more active life.	0.30	0.47	0.36	0.50
		α*= **0.55**		α= **0.61**	
Social and Aesthetic Benefits of Weight Control (SABen)					
7	Obese people would be treated better if they lost weight.	0.55	0.65	0.56	0.67
10	People with an ideal bodyweight are taken more seriously.	0.46	0.68	0.48	0.70
14	Obese people would have a better social life if they lost weight.	0.50	0.66	0.53	0.68
17	Very overweight people are considered less attractive.	0.44	0.69	0.47	0.71
22	Obese people are embarrassed by the way they look.	0.45	0.68	0.48	0.70
		α= **0.72**		α= **0.74**	
Costs of and Barriers to Weight Control (Costs)					
2	Maintaining an ideal bodyweight is boring.	0.55	0.75	0.55	0.78
4	Maintaining an ideal bodyweight takes a lot of effort.	0.58	0.74	0.59	0.77
8	People have to deny themselves a great deal to avoid obesity.	0.57	0.75	0.59	0.77
12	Maintaining an ideal bodyweight makes life less fun.	0.56	0.75	0.56	0.78
16	A person who avoids obesity has a restricted lifestyle.	0.59	0.74	0.66	0.76
21	Maintaining an ideal bodyweight is expensive.	0.38	0.79	0.44	0.80
		α= **0.78**		α= **0.81**	

**Cronbach's Alpha Coefficient for subscale*

5.5.3.6 Obesity Outcome Expectancy Belief Scale Scores

5.5.3.6.1 ObEx-15 Scale Score Distributions

In order to investigate the distribution of score on the three subscales of the ObEx-15 and the total scale, descriptive statistics (Table 5.23) and histograms (Figure 5.3 a) – d)) were calculated for the sample of cases with no missing data and no univariate or multivariate outliers (n = 286).

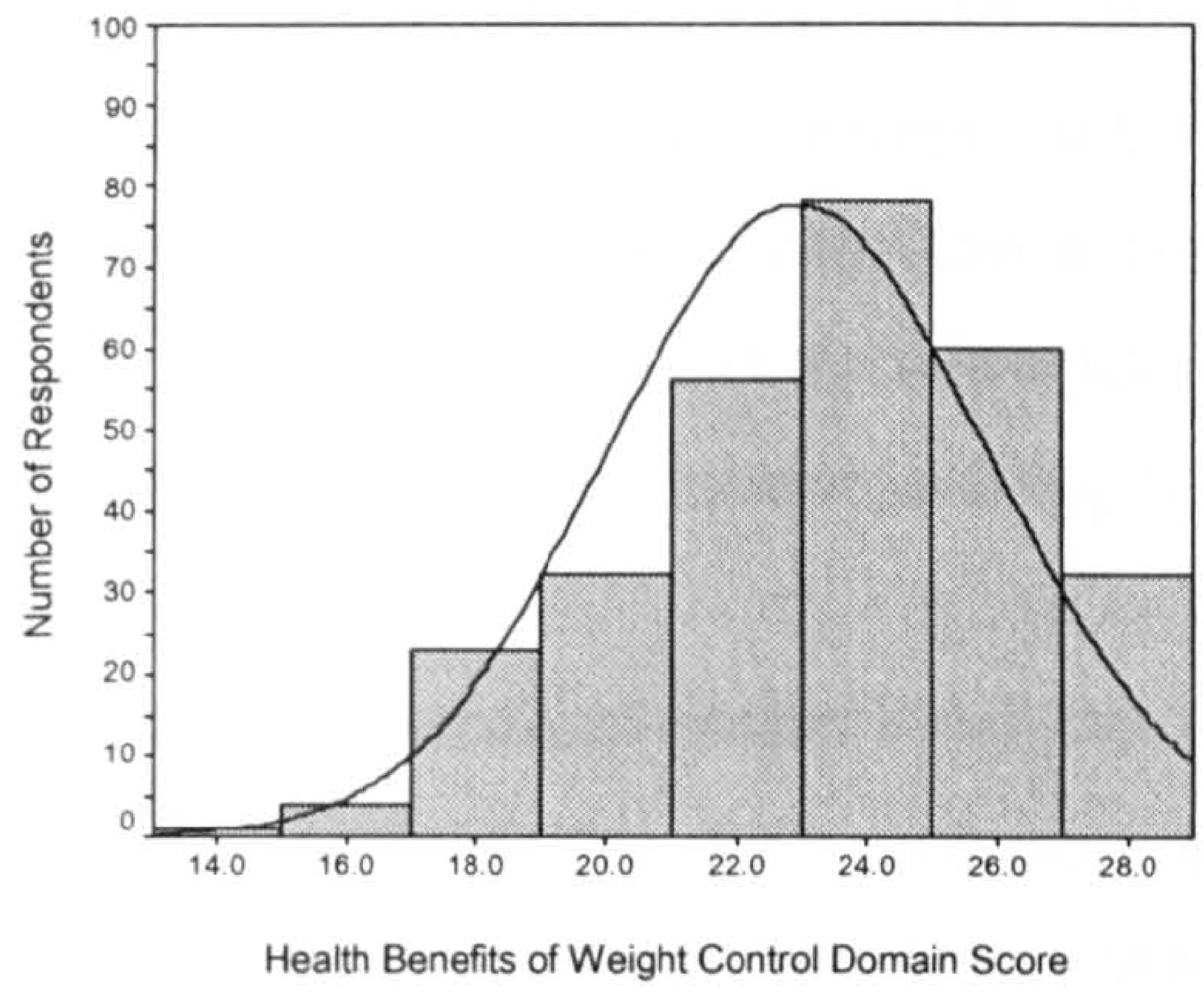
Table 5.23 Study Three: ObEx-15 Scale Scores Distribution Statistics

			ObEx-15 Subscales		
		Total OBEx-15 Scale	**Health Benefits of Weight Control**	**Social & Aesthetic Benefits of Weight Control**	**Costs of & Barriers to Weight Control**
Possible Range		15-105	4-28	5-35	6-42
Min-Max		52-105	14-28	6-35	6-42
Mean		74.87	22.94	22.83	29.09
SD		9.01	2.93	5.43	6.77
95% Confidence Interval	Lower Bound	73.82	22.60	22.20	28.31
	Upper Bound	75.92	23.29	23.46	29.88
Median		74.0	23.0	23.0	30.0
Inter-quartile Range		12.25	4.0	8.0	9.0

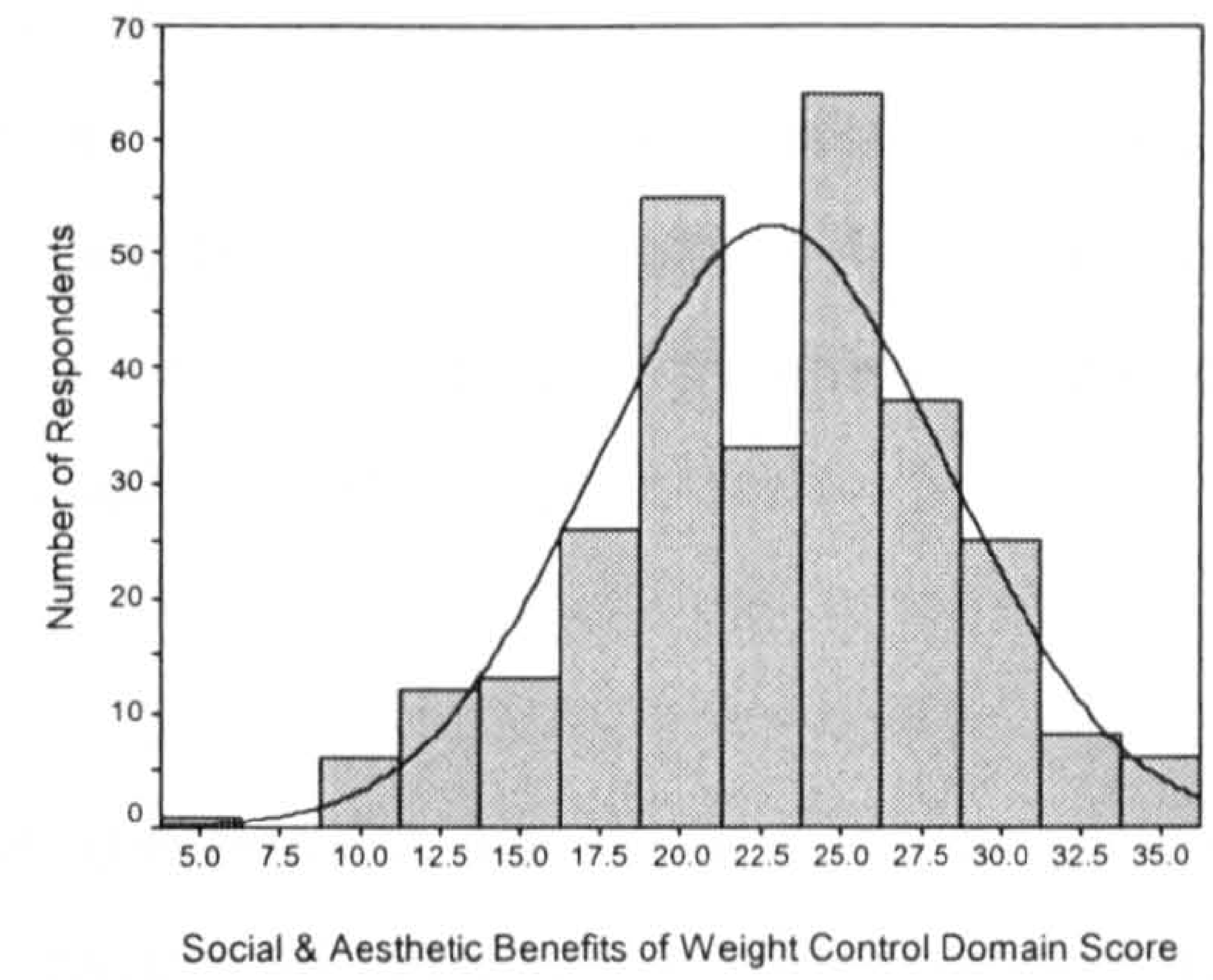
N.B. Median and Interquartile Range reported for distributions with non-Gaussian distributions only

Figure 5.3 Study Three: Obesity Outcome Expectancy Belief Scale Scores

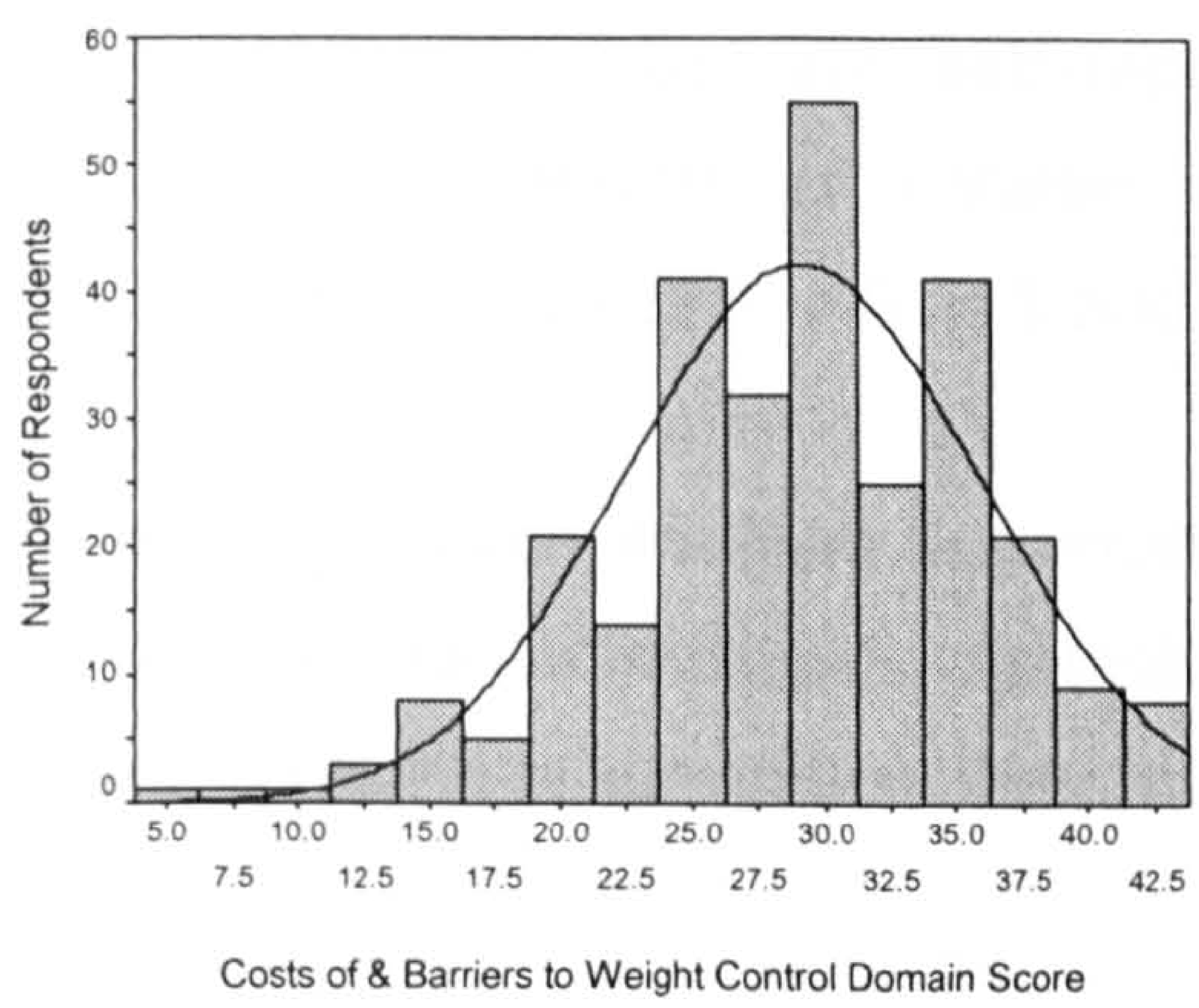
a) Health Benefits of Weight Control Subscale Scores



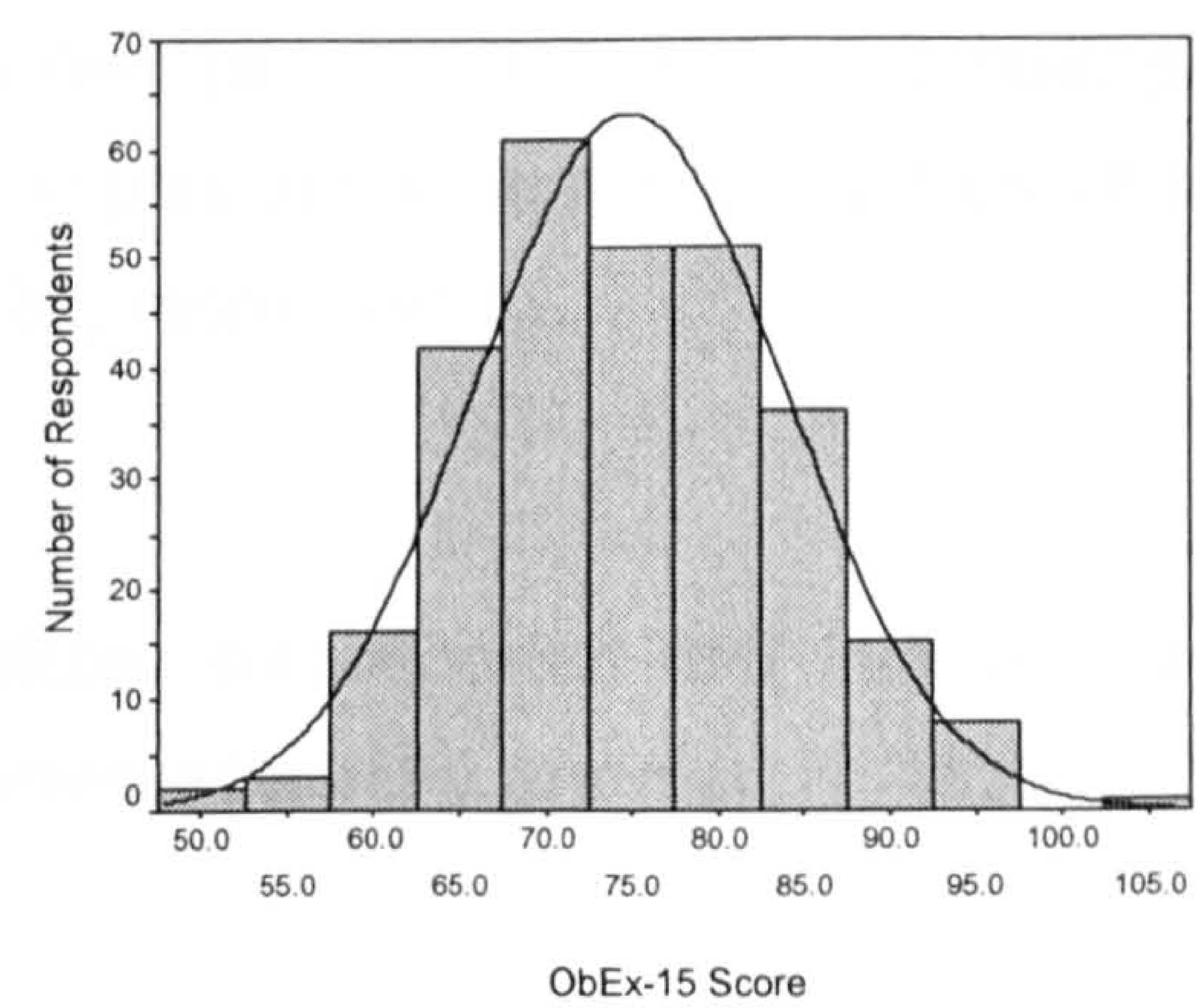
b) Social & Aesthetic Benefits of Weight Control Subscale Scores



c) Costs of & Barriers to Weight Control Subscale Scores



d) ObEx-15 Scale Scores



5.5.3.6.2 ObEx-15 Scale Score Predictive Variables

In order to investigate the extent to which sociodemographic factors and self-reported BMI were significant related to ObEx-15 scale scores, a standard linear multiple regression was performed.

Data Screening

The 302 cases with complete ObEx-15 scale scores were screened for missing values on age, sex, socioeconomic status, education level, ethnicity, marital status, Health as a Value scores and self-reported BMI using SPSS Missing Value Analysis. As socioeconomic status was missing 44 values (13.6%) and education was missing 20 values (6.6%), t-tests and Chi-squares were requested to investigate whether the missing values were related to any other variable. Separate Variance t Tests and Chi-square tests show no systematic relationship between missingness on socioeconomic status or education level and any other variable. Of the dichotomous variables, only ethnicity exceeded the maximum recommended 90%:10% split (93.4%:6.3%) and was removed from the analysis. Seventy-two cases with missing values on the remaining seven independent variables were, therefore, deleted from the data-set. A further four cases were deleted as they were identified as representing significant univariate outliers. No case represented a significant multivariate outlier.

Standard Linear Regression Analysis

ObEx-15 scale score was entered as the dependent variable with age, self-reported BMI, sex, social class, martial status, Health as a Value score and education level entered as independent variables. The partial regression coefficients were statistically significant for Health as a Value score (B = 1.829, $t_{224} = 3.099$, $p < 0.01$) and self-reported BMI (B = -0.309, $t_{224} = -2.008$, $p < 0.05$) only, with Health as a Value score explaining a higher proportion of the variance (standardised $\beta = 0.215$ and -0.138, respectively).

Multiple Regression Analysis Assumptions

The scatter plot of residuals against predicted self-reported BMI indicates that the assumptions of normality, linearity, homoscedasticity are met.

5.3.3.6.3 Health Benefits of Weight Control Subscale Scores & ORKS-10 Scores

In order to investigate the extent to which the Health Benefits of Weight Control Subscale Scores were correlated with ORKS-10 scale scores, a simple bivariate correlation analysis was performed on the 297 cases with complete data. Health Benefits of Weight Control Subscale Scores were significantly and positively correlated with ORKS-10 scale scores ($r_s = 0.271$, $n = 297$, $p < 0.001$).

5.5.4 STUDY THREE DISCUSSION

5.5.4.1 ObEx-15 Scale Psychometric Properties

Although the significant and exclusive factor loadings produced in Study Two are maintained for the Social and Aesthetic Benefits of Weight Control Subscale and the Costs of and Barriers to Weight Control Subscale, the Health Benefits of Weight Control Subscale, does not appear to be replicated in this new sample.

In the factor solution produced from the full sample (P2-A), all items continue to load significantly and exclusively on their designated factors with the exception of item 15 ('A person with an ideal bodyweight can lead a more active life'). Although part of the Health Benefits of Weight Control Subscale, this item only achieves a loading of 0.20 on this factor and has a loading of 0.53 on the Social and Aesthetic Benefits of Weight Control domain factor. When the factor analysis is re-run using data with no significant univariate or multivariate outliers (P3-B), item 15 continues to behave imperfectly as, although it loads significantly on its designated factor, it also loads 0.31 on the Social and Aesthetic Benefits of Weight Control domain. These findings suggest that although the HBen Subscale accounts for a significant proportion of the variance in item 15 scores, it does not represent an adequately pure measure. This perhaps is not surprising when the item itself is considered; an 'active life' could conceivably refer to a life in which neither health nor social pressures impinged upon an individual's ability and enjoyment of a range of activities.

In addition, in analysis P3-B, item 1 ('An obese person needs more medical care') produces a factor loading of 0.25 on its designated HBen factor, just failing to be considered significant (i.e. >0.3). However, as cut-offs are essentially arbitrary figures which can be chosen on the basis of intuitive as well as statistical reasons [91], an argument could be made for lowering the criteria to ≥0.3 and retaining it in the ObEx-15 scale.

Both the Social and Aesthetic Benefits of Weight Control Subscale and the Costs of and Barriers of Weight Control Subscale produce Cronbach's Alpha coefficients that meet the criteria for internal consistency (≥ 0.7). In addition, neither subscale would be improved by the removal of any item re-establishing the finding that an acceptable balance has been struck between scale brevity and reliability. The Health Benefits of Weight Control Subscale, however, produced a Cronbach's Alpha coefficient < 0.7 which could be marginally, although not significantly, improved with the removal of item 1. Although the HBen Subscale could be dismissed as unreliable, it must be kept in mind that the 0.7 cut-off is arbitrarily defined and that lower Cronbach's Alpha coefficients are considered acceptable. It does, for example, exceed Bowling's criteria of 0.5 [90].

As in Study Two, although the ObEx-15 scale and the SABen and Costs subscales produce a good spread of scores with no significant ceiling or floor effects, the HBen subscale demonstrates a moderate ceiling effect, thereby limiting its capacity to discriminate between individuals with very positive beliefs.

5.5.4.2 Correlates of ObEx-15 Scale Scores

In order to further investigate the finding from Study Two that self-reported BMI and socioeconomic status was negatively correlated with ObEx-15 scale score, multivariate analysis were employed which allowed for the rigorous control of potentially confounding sociodemographic factors. While this confirmed that ObEx-15 scale scores were significantly and negatively correlated with self-reported BMI, it did not confirm the surprising association between ObEx-15 scale scores and socioeconomic status. Instead Health as a Value score was found to be a significant and positive predictor of beliefs regarding the utility of weight control. Although age was shown to significantly and positively predict Obesity Risk Knowledge Scale (ORKS-10) scores, as discussed in Section 4.4.4.1, this association was postulated to be mediated by an increase in health salience. Studies have previously demonstrated a positive relationship between age and health value (e.g. [223]) and between health saliency and outcome expectancies (e.g. [224]). This supposition is supported in the present study by the finding that, in a linear multiple regression model excluding Health as a Value scores, age emerged as a significant and positive predictor of ObEx-15 scale scores (data not shown). These results, therefore, offer some support for the scale's convergent validity.

Although the fact that self-reported BMI continues to significantly correlate with ObEx-15 scale scores adds more support for the hypothesis that beliefs regarding the consequences of obesity will promote weight control behaviour, this finding must still be treated with caution due to the cross-sectional nature of the data.

Upon inspection, beliefs regarding the health benefits of weight control and knowledge regarding the health effects of obesity appear to have overlapping domains as the only thing that separates an aspect of knowledge from a belief is the ability to establish its 'truth'. Although the Health Benefits of Weight Control Subscale scores might be expected to be somewhat correlated with ORKS-10 scale scores, the fact that they were developed partly using the same samples also raises the potential for autocollinearity. Although highly significant, the size of correlation coefficient produced can be interpreted as 'small' to 'medium' [225]. This supports the hypothesis that the two domains are measuring similar, although not identical constructs.

5.5.4.3 Study Strengths & Limitations

5.5.4.3.1 Response Rate

Although a reasonable response rate was achieved for Study Two (46.5%), only 320 questionnaires were returned from the 1329 distributed (24.1%) in Study Three. As discussed in Section 4.5.4.2.2, this disappointing rate of return is mainly due to the poor response in Sample B (14.9%) while Sample A – a retail-sector employee sample similar to that used in Study Two - produced a reasonable rate of 38.8%.

Once again, it is clear that it is the minority of individuals approached who were sufficiently motivated to complete the questionnaire which may have significant, although unobservable effects on the representativeness of the sample.

5.5.4.3.2 Sample Size

As there were less than 3% missing data for any item, they were not considered to represent a significant source of bias and so cases with missing data were deleted from the data set [91]. This procedure resulted in the deletion of eighteen cases which did not significantly alter the adequacy of the sample size (n = 302) as it exceeds even the stringent requirement of 300 cases recommended by Tabachnick and Fidell [91]. However, within the sample of 302 responses with no missing data, a number of univariate and multivariate outlier cases were observed which were not eliminated by data transformation procedures. As deletion of these cases had a significant impact on the resulting sample size (n = 286), the decision was made to retain these cases in the initial analysis, but then to repeat the analysis with these cases removed to observe their impact. In this way, larger sample sizes could be maintained if the cases had little impact on the analysis.

In terms of the multivariate analyses, even with the removal of potential confounding cases, the sample sizes comfortably exceeded the recommended minimum requirement of 10 cases per variable [206].

In contrast to Study Two, participants who indicated that they had trouble reading English were not excluded from the analysis. This was in response to advice from a research ethics committee regarding a separate study which considered the exclusion of such participants as unethical. The questionnaires from the five participants who indicated that they had trouble reading English were examined, and it was found that the respondents were capable of correctly interpreting the instruction 'What is the full title of your job? (please give as much detail as possible)' as they all provided code-able job descriptions (three Blue Collar Occupations and two White Collar Occupations). In addition, all respondents completed every item of the Obesity Outcome Expectancy Belief Scale. This suggests that the participants could, in fact, adequately understand written English. As only one of these five participants on the ObEx-15 scale scored in excess of one standard deviation from the group mean (data not shown), they are also unlikely to significantly skew the results.

5.5.4.3.3 Sample Representativeness

The sampling was opportunistic rather than stratified and, therefore, can be criticised in terms of its representativeness of the UK population. This sample, however, was more diverse than the sample used in Study Two, particularly in terms of gender, and, therefore, does offer more information as to the scale's utility.

Once again the psychometric properties of the scale were assessed using data from a sample heterogenous for several potentially influential sociodemographic factors. The sample obtained in Study Three contains 166 females and 133 males with useable responses (i.e. no missing values), both of which would both meet the criteria Kline's sample size criteria for factor analysis [78], if not Tabachnick and Fidell's [91] and Comfrey's [93]. However, separate factor analyses were not considered to be appropriate as these samples significantly differ in other potentially influential criteria (data not shown). The multiple regression analyses, however, indicate that the majority of sociodemographic variables were not significant predictors of ObEx-15 scale scores. It does, however, suggest that for example, to ensure that the ObEx-15 scale is unidimensional in different age groups, further research would be required.

5.5.4.3.4 Factor Analysis

To ensure that the factor analyses were carried out on a suitable data set, the 15 items of the ObEx-15 scale were assessed in terms of multivariate normality (i.e. univariate normality, linearity, and homoscedasticity) and multicollinearity. Although multicollinearity was not present in either data set, the variables failed the criteria for multivariate normality even when the data was subjected to a square root transformation.

Factor analysis was, once again, considered to be an appropriate statistical procedure for this data set as all the correlation matrices produced contained an adequate number of substantial correlations measured by the Kaiser-Myer-Olkin measure of sampling adequacy value, and were, therefore subject to a Principal Factor Analysis (PFA) extraction followed by Oblimin rotation with Kaiser Normalization.

Although the factor loadings of the Health Benefits of Weight Control Subscale items were negative in the Study Two factor solutions, positive loadings were found in both Study Three factor solutions. In addition, the Study Three factor solution produced from data with no significant univariate or multivariate outliers (P2-B), indicates that the items from the Costs of and Barriers to Weight Control Subscale were characterised by negative factor loadings.

5.5.5 STUDY THREE CONCLUSION

This study has firmly established that the Social and Aesthetic Benefits of Weight Control and Costs of and Barriers to Weight Control Subscale of the Obesity Outcome Expectancy Belief Scale (ObEx-15) are both reliable and unidimensional. Although the Health Benefits of Weight Control Subscale fails to reach the most stringent psychometric criteria, it does appear to have the potential to offer a useful measure of health-related outcome expectancy beliefs, over-and-above the Obesity Risk Knowledge Scale (ORKS-10). The ObEx-15 scale has also demonstrated some construct validity through its positive association with health value.

5.6 CHAPTER FIVE DISCUSSION & CONCLUSIONS

Although the ObEx-15 scale has demonstrated some construct validity, as discussed in Section 2.4.5.1, the validation process can be considered to be a continual process involving a range of possible evidence. Additional validation in the form of concurrent validity could, for example, be established by correlating responses to the ObEx-15 scale with other, well-validated measures of the same construct [54]. However, as with the Obesity Risk Knowledge Scale, the justification for the development of a new scale is based on the fact that no psychometrically sound measures currently exist. Scores, however, might be expected to correlate with Allison, Basile and Yucker's Attitudes Toward Obese People (ATOP) scale [131] which, as discussed in Section 3.4.3, contains many items that assess obesity outcome expectancies. Alternatively, the Health Benefits of Weight Control Subscale might be expected to correlate with scores obtained on Ogden's medical consequences of obesity belief scale [148].

Content validity, however, would not be appropriate for a scale such as the ObEx-15 scale. As discussed in Section 2.4.5.2, content validity is only appropriate for domains that can be clearly defined. It was, however, hoped that the in-depth, qualitative research conducted in order to generate salient beliefs would ensure that, as far as possible, the item pool represented a well-balanced and salient sample of content domains.

Despite this, it is clear that beliefs regarding the health benefits of weight control are not being optimally assessed by the HBen subscale. In study one, it was noted that participants found it difficult to discuss the health risks associated with excess adiposity suggesting that further, more focussed qualitative research is needed in order to reveal the different dimensions that appear to underpin the concept broadly defined here as health benefits beliefs. In particular, items regarding the psychological consequences of obesity such as '*Obese people have more mental health problems*' and '*Very overweight people would be happier if they lost weight*' did not make it into the final scale. As with the Obesity Risk Knowledge Scale (ORKS-10), further research has the potential to develop and/or expand upon all of the existing subscales.

However the ObEx-15 scale is a psychometrically sound measure of salient obesity expectancy beliefs and, therefore, has the potential to play a key part in prospective research in order to fully determine the role of these constructs in weight control behaviour.

CHAPTER SIX:
THE RELATIONSHIP BETWEEN WEIGHT CONTROL INTENTIONS & OBESITY OUTCOME EXPECTANCIES IN OBESE INDIVIDUALS

6.1 CHAPTER SIX INTRODUCTION

As originally described by Expectancy Value Theory [56] and Subjective Expected Utility Theory [57], outcome expectancies are thought to predict behaviour and represent a central feature of current health behaviour research. Although obesity outcome expectancies are implicated in some obesity treatment and prevention strategies, their role in predicting weight control behaviour is yet to be established. As discussed in Section 3.4.4, several studies have assessed Body Mass Index in different populations concurrently with obesity outcome expectancy, albeit with mixed results. The results of Chapter Four and Five also demonstrate mixed results as, although a higher utility for weight control was significantly associated with lower self-reported Body Mass Index, no significant association was found between BMI and obesity health risk knowledge.

Cross-sectional data comparing potential determinants with outcome is, however, insufficient to claim a causal relationship. Nevertheless, the case for causality does become more compelling if differences in potential determinants are shown to predict future behaviour. An alternative to actual behaviour, which has the benefit of being measured concurrently, is behavioural intention. The concept of intention as a proxy for behaviour is derived from Ajzen and colleagues' Theory of Reasoned Action and the Theory of Planned Behaviour [65]. Behavioural intentions are defined as the perceived likelihood of performing the behaviour, and are considered to represent the immediate determinant of behaviour [53]. This contention is supported by a recent meta-analysis of 63 empirical tests of the Theory of Planned Behaviour, which revealed that intentions and behaviour produced a correlation coefficient of 0.47 [66].

Previous research has demonstrated that, in general, individuals who are more likely to practise health-enhancing behaviours are younger, female and wealthier [55]. According to social cognition theory, the effect of sociodemographic characteristics on intentions is mediated by cognitive factors [55]; a situation explicitly represented in the Health Belief Model [59]. However, sociodemographic characteristics potentially represent confounding factors in the relationship between obesity outcome expectancies and intentions and, therefore, require consideration in statistical analysis.

Another factor that requires attention is health-related quality of life (HRQL). For many obese individuals, the physical and psychosocial risks associated with a BMI $\geq$ 30 kg/m^2 will be manifest. The extent to which an individual is experiencing the negative impacts of obesity might, therefore, represent an important motivating factor for engaging in weight control behaviour. It has, for example, been reported that, even when controlled for possible confounding factors, obese individuals seeking treatment from a university-based outpatient weight management clinic, showed a higher prevalence of obesity-related comorbidities and significantly impaired HRQL, in terms of bodily pain, general health and vitality, compared to obese individuals who were not actively seeking treatment [26]. The potential role for HRQL as a distal determinant of obesity-related intentions has been identified by Fontaine and Barofsky as an important research question – "What is the role of HRQL in a person's decision to attempt to lose weight or to seek programmatic weight-reduction treatment?" (p179, [24]). In a similar way, past behaviour has previously been associated with both cognitions and independently with future behaviour [226].

Lau, Hartman and Ware have demonstrated that in some instances, beliefs regarding the overall utility of health behaviours were more predictive of the behaviour's performance in individuals with a high health value [222]. Assessment of health saliency may, therefore, aid interpretation of obesity outcome expectancies' relationship with weight control intentions.

As discussed in Chapters Four and Five, the Obesity Risk Knowledge Scale (ORKS-10) and the Obesity Outcome Expectancy Belief Scale (ObEx-15) represent generic, psychometrically sound measures of obesity outcome expectancies. If obesity outcome expectancies, as assessed by these scales, were shown to predict weight control intentions in obese clinic attenders whilst controlling for potentially confounding factors, this would lend support for the use of individual-orientated health promotion strategies for the treatment of obesity in this high-risk group.

However, to be maximally effectively, such interventions would need to "...start where people are: developmentally, emotionally and socially" (p173, [227]). As discussed in Section 2.2, experience is thought to determine cognitions. Obese clinic attenders might, therefore, be expected to be knowledgeable of the health risks associated with obesity, strongly endorse the health, social and aesthetic consequences of obesity and also the costs and barriers to weight control.

6.2 AIMS AND HYPOTHESES

AIM ONE:

To describe obesity outcome expectancies, as measured by the Health Benefits of Weight Control (HBen), Social and Aesthetic Benefits of Weight Control (SABen) and Costs of and Barriers to Weight Control (Costs) subscales of the Obesity Outcome Expectancy Belief Scale (ObEx-15) and the Obesity Risk Knowledge Sale (ORKS-10), among obese patients attending weight management clinics.

Hypothesis One:

Obese patients attending weight management clinics will:

a) strongly endorse the health benefits of weight control.
b) strongly endorse the social and aesthetic benefits of weight control.
c) strongly endorse the costs of and barriers to weight control.
d) display high levels of knowledge regarding the health risks associated with obesity.

AIM TWO:

To examine the relationship between weight control intentions and sociodemographic characteristics, health-related factors, and obesity outcome expectancies among obese patients attending weight management clinics.

Hypothesis Two:

In accordance with Expectancy Value Theory [56] and Subjective Expected Utility Theory [57], strength of intention to engage in weight control behaviour will be significantly and positively associated with:

a) endorsement of the health benefits of weight control.
b) endorsement of the social and aesthetic benefits of weight control.
c) rejection of the costs of and barriers to weight control.
d) levels of knowledge regarding the health risks associated with obesity.

6.3 CHAPTER SIX METHOD

6.3.1 STUDY DESIGN

A cross-sectional survey.

6.3.2 SAMPLING

Opportunistic sampling was used to recruit obese (BMI ≥ 30 kg/m^2) participants attending a weight management clinic onto the study.

6.3.3 MEASURES

6.3.3.1 Self-Administered Questionnaire

6.3.3.1.1 Obesity Risk Knowledge Scale (ORKS-10)

The Obesity Risk Knowledge Scale (ORKS-10) is a reliable, discriminant and valid 10-item scale assessing knowledge regarding the effects of obesity on health suitable for individuals aged 12 and over, as described in Section 4.5.2.3.1.

6.3.3.1.2 Obesity Outcome Expectancy Belief Scale (ObEx-15)

The Obesity Outcome Expectancy Belief Scale (ObEx-15) is a psychometrically sound, three domain scale suitable for individuals aged 12 and over, as described in Chapter Five. Items are scored so that higher scores on the SABen subscale indicates stronger endorsement of the social and aesthetic benefits of weight control while higher scores on the HBen subscale indicates stronger endorsement of the health benefits of weight control. Higher scores on the Cost subscale indicates stronger rejection of the costs of and barriers to weight control.

6.3.3.1.3 Health as a Value Scale

The Health Value Scale is a reliable and valid four item scale, developed by Lau, Hartman and Ware to provide a general measure of health value [222], as described in Section 5.5.2.3.4.

6.3.3.1.4 Sociodemographic Characteristics

A series of closed format items were used to obtain details of age, gender, ethnicity, marital status and level of education. Occupation was obtained using a free response question and status coded using the National Statistics Socio-economic Classification (NS-SEC) [205]. Respondents were also asked to record their current height and weight, from which self-reported Body Mass Index (kg/m^2) was calculated.

6.3.3.1.5 Health-Related Quality of Life

The 12-item Short Form Health Survey Version 1 (SF-12v1) Standard Form (4-Week Recall) is a self-administered scale designed to assess self-perceived health-related quality of life [228]. The SF-12v1 was developed to provide a shorter version of the SF-36 Heath Survey and is comprised of a Physical Component Summary (PCS-12) and a Mental Component Summary (MCS-12). The scores from PCS-12 and MCS-12 of the SF-12v1 and the SF-36 showed a high degree of correspondence and the SF-1v1 has proved to be both reliable and valid [228]. The SF-1v1 has a Flesch-Kincaid Grade Level of 8.2 (UK equivalent = Year 9) which suggests that the language used is suitable for individuals aged 13 years and above. SF-12v1 summary measure scores were calculated using the methods described by Ware *et al.* so that higher scores indicate better self-perceived health [96].

6.3.3.1.6 Behavioural Intentions

Participants were asked to identify their 12 month goal weight using the question *'In 12 months time, how much do you intend to weigh?'* and the answer *'My 12 month goal weight is......'*. Responses, along with self-reported current weight, were used to calculate intended weight-loss as a percentage of current weight. In order to assess the strength of intentions to engage in weight control behaviour over the next 12 months, participants were asked to rate three items using a seven-point Likert Scale; *'I intend to achieve my 12 month goal weight'*, *'I intend to achieve my 12 month goal weight by sticking to a diet'*, and *'I intend to achieve my 12 month goal weight by taking part in physical activity'*. Responses to each item were scored so that strongly agree = 7, agree = 6, moderately agree = 5, neither agree nor disagree = 4, moderately disagree = 3, disagree = 2, and strongly disagree = 1. Scores from each of these three items were summed to create the Intentions to Engage in Weight Control Scale where higher scores reflected stronger intentions to engage in weight control behaviour over the next 12 months.

6.3.3.2 Medical Record Review

Participants' medical records were reviewed and a standard Medical Record Checklist was completed in order to record information regarding history of and current obesity-related comorbidities (e.g. cardiovascular, musculoskeletal and respiratory problems). Details on how long the participant had been attending the weight management clinic and their weight at entry were also recorded.

6.3.4 PROCEDURES

6.3.4.1 Data Collection

All patients aged 18 or over whose name appeared on the Queen's Medical Centre University Hospital out-patient weight management clinics lists, between September and December 2004, received a written invitation to take part in the study. All potential participants identified from the clinic lists were sent an invitation letter, patient information sheet, consent form and a copy of the self-administered questionnaire as outlined in Section 6.3.3.1. Participants either returned their completed questionnaire and consent form at their next clinic appointment or mailed the paperwork back in the freepost envelope provided. In the event of missing data, participants were contacted once in order to obtain the relevant information. No incentives were offered. A researcher was available at each clinic appointment to collect completed questionnaires and consent forms, answer any questions and deal with any comprehension issues. Participants who had trouble reading English were advised to seek the assistance of a friend or relative to translate the relevant documentation. On receipt of a completed consent form, a Medical Record Checklist was completed and a letter sent to the participant's general practitioner, informing them of their patient's involvement in the study. All data was collected by the author and a 3rd year BMedSci student.

6.3.4.2 Data Analysis

All data analyses were conducted using SPSS (Version 11.5). Appropriate parametric or non-parametric statistics were then used to describe the sample and to examine the relationship between weight control intentions and sociodemographic characteristics, health-related factors, and obesity outcome expectancies. In order to conduct these analyses, categorical variables were collapsed into dichotomous variables, so that Social Class was coded as 'Blue Collar occupations' (social class 3 'routine and manual occupations') and 'White Collar occupations' (social class 1 'managerial and professional occupations' and social class 2 'intermediate occupations'), education level as 'no higher qualification' (left school before exams or attained a GCSE qualification or equivalent) and 'higher qualifications' (attained an A-level, A-level equivalent or more advanced qualification), ethnicity as 'White European' and 'Non-White European', and martial status 'Cohabiting' (married / cohabiting) or 'Not cohabiting' (single, widowed, or divorced / separated).

Hierarchical multiple regression analyses were also conducted to investigate the extent to which obesity outcome expectancies predict strength of intention to engage in weight control behaviour, whilst controlling for potentially confounding sociodemographic factors. However, prior to this, the data-set was screened for missing values and examined for fit between the variables and the assumptions of multivariate analysis as described by Tabachnick and Fidell [91].

6.3.4.3 Ethical Considerations

This study received approval from the COREC approved Nottingham Research Ethics Committee and Queen's Medical Centre University Hospital NHS Trust Research and Development Department (Appendix Three). All information collected from the participants was identified using a Study Identification Number and was stored separately from names and contact details.

6.4 CHAPTER SIX RESULTS

6.4.1 RESPONSE RATE

Of the 203 individuals, 71 males and 132 females, invited to participate in this study, 114 responses were received, resulting in a response rate of 56.12%. However, four individuals were identified as having a self-reported Body Mass Index < 30 kg/m^2 and were, therefore, deleted from the data set, resulting in a useable response rate of 54.19%.

6.4.2 SOCIODEMOGRAPHIC & HEALTH CHARACTERISTICS

While participants ranged widely in age, the sample was predominately female, White British / European and co-habiting (Table 6.1 and 6.2). Although all three social classes of the National Statistics Socioeconomic Classification were represented by the sample, a large number of participants were unclassifiable according to this system with the level of information available (Table 6.3). Creating a dichotomous variable as described in Section 6.3.4.2, therefore resulted in missing values on socioeconomic status in just under half the sample.

Although participants had to be classified as obese (>30 kg/m^2) to be eligible for inclusion in the study, the median Body Mass Index exceeded 40 kg/m^2, indicating that the sample was, on average, morbidly obese (Table 6.1). Over half the participants had a least one obesity-related comorbidity recorded in their medical records and of these, 42.19% suffered from psychological, 35.94% from pulmonary, 71.88% from metabolic or endocrine, and 67.12% from cardiovascular complications. In terms of self-perceived health-related quality of life, participants scored, on average, lower than both US [96] and UK [229] general populations on the SF-12v1 Physical Component Summary and the Mental Component Summary (Table 6.4).

Participants varied widely in the length of time they had attended the weight management clinic and the amount of weight loss they had achieved (Table 6.1). Since entering the clinic, 23 of the 94 participants for whom data was available (24.5%) had achieved a weight loss of ≥ 10% of their entry bodyweight, while 21 participants (22.3%) had gained weight.

Table 6.1 Continuous Sociodemographic & Health-Related Characteristics

	n[a]	Min	Max	Mean	Standard Deviation	Median[b]	Inter-quartile Range[b]
Age (years)	109	17.65	74.01	45.91	11.93	-	-
Self-Reported Body Mass Index (kg/m^2)	108	30.75	71.81	45.33	9.10	43.89	13.60
Length of attendance at clinic (months)	100	1.64	118.03	27.28	22.94	18.23	27.30
Weight change since entry to clinic (percent of weight at entry)[c]	94	-25.01	26.40	4.97	8.39	-	-

[a]*Number of participants with complete data*
[b]*Median and Interquartile Range reported for non-Gaussian distributions only*
[c]*Negative values indicate weight gain*

Table 6.2 Dichotomous Sociodemographic Characteristics

	Number of Participants	Proportion of Sample (%)
Gender		
Female	74	67.3
Male	36	32.7
Marital Status		
Single	33	30
Cohabiting	77	70
Ethnicity		
Non-White European	8	7.3
White European	102	92.7
Education Level		
No Higher Qualification	62	56.4
Higher Qualification	41	37.3
Missing Values	7	6.4

Table 6.3 Social Class Distribution

Occupation	n[a]	%[b]	Collapsed Classification	n[a]	%[b]
Managerial & Professionals Occupations	21	19.1	White Collar Occupations	35	31.8
Intermediate Occupations	14	12.7			
Routine & Manual Occupations	24	21.8	Blue Collar Occupations	24	21.8
Unemployed	20	18.2	Uncodeable	51	46.4
Retired	23	20.9			
Homemakers	6	5.5			
Full-time Students	2	1.8			

[a]*n = number of participants*
[b]*% = proportion of sample*

Table 6.4 SF-12 Component Summary Scores

	n[a]	Min	Max	Mean	Standard Deviation	Median	Inter-quartile Range
SF-12 Physical Component Summary Score							
Participants from this study	106	17.26	64.22	38.31	13.22	34.27	25.50
UK general population[c]	8204	-[b]	-	50.0	9.72	-	-
US general population[d]	2329	13	69	50.12	9.45	53.55	9.96
SF-12 Mental Component Summary Score							
Participants from this study	106	11.62	65.90	40.21	12.95	38.58	21.83
UK general population[c]	6057	-	-	50.0	9.72	-	-
US general population[d]	2329	10	70	50.04	9.59	52.85	12.17

[a]*number of participants for who data is available*
[b]*- = data not published*
[c]*participants of the Oxford Healthy Lifestyles Survey [229]*
[d]*data taken from Appendix E, Ware et al., 2004 [96]*

6.4.3 OBESITY OUTCOME EXPECTANCIES & HEALTH VALUE

On average, participants' ORKS-10 scale or HBen subscale scores did not significantly differ from scores achieved by a UK community sample (Table 6.5). However, compared to a UK community sample, participants did score significantly higher on the Social and Aesthetic Benefits of Weight Control subscale (SABen) and significantly lower on the Costs of and Barriers to Weight Control subscale (Cost) of the ObEx-15 scale (Table 6.5). In terms of health value, participants did not score significantly differently from a UK community sample (Table 6.5).

Table 6.5 Obesity Outcome Expectancy & Health as a Value Scale Score Distributions

	n[a]	Min	Max	Mean	Standard Deviation	Median[b]	Interquartile Range[b]	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
ORKS-10 Scale									
Study Participants	109	0	8	4.19	1.82	4.0	3.0	3.85	4.54
Community sample[c]	231	0	8	3.80	1.78	4.0	2.0	3.57	4.03
HBen Subscale									
Study Participants	110	9	28	23.84	3.56	24.50	4.0	23.16	24.51
Community sample[d]	286	14	28	22.94	2.93	23.0	4.0	22.60	23.30
SABen Subscale									
Study Participants	109	9	35	27.54	6.50	29.0	10.0	26.31	28.78
Community sample[d]	286	6	35	22.83	5.43	23.0	8.0	22.20	23.46
Cost Subscale									
Study Participants	109	7	38	21.94	6.96	21.0	10.0	20.61	23.26
Community sample[d]	286	6	42	29.09	6.77	30.0	9.0	28.31	29.88
Health as a Value Scale									
Study Participants	108	6	28	20.17	4.78	20.0	7.75	19.25	21.08
Community sample[d]	300	5	28	20.29	4.43	20.0	7.0	19.78	20.79

[a]Number of participants with complete data
[b]Median and Interquartile Range reported for non-Gaussian data only
[c]see Section 4.5.3 for details regarding the sample
[d]see Section 5.5.3 for details regarding the sample

A number of significant and positive univariate correlations were revealed between the obesity outcome expectancy variables and Health as a Value Scale score (Table 6.6).

Table 6.6 Obesity Outcome Expectancy & Health as a Value Scale Score Univariate Correlations

	ORKS-10 Score	**ObEx-15 Subscales: HBen Score**	**ObEx-15 Subscales: SABen Score**	**ObEx-15 Subscales: Cost Score**
ObEx-15 Subscales: HBen Score	n = 109; r_s = 0.295; $p < 0.01$			
ObEx-15 Subscales: SABen Score	n = 109; r_s = 0.265; $p < 0.01$	n = 109; r_s = 0.570; $p < 0.001$		
ObEx-15 Subscales: Cost Score	NS[a]	NS	n = 109; r_s=-0.285; $p < 0.01$	
Health as a Value Scale Score	n = 108; r_s = 0.388; $p < 0.001$	n = 108; r_s = 0.293; $p < 0.01$	n = 108; r_s = 0.319; $p < 0.01$	n = 108; r_s = 0.215; $p < 0.05$

[a]NS = non-significant correlation

6.4.4 WEIGHT CONTROL GOALS & STRENGTH OF INTENTIONS TO ENGAGE IN WEIGHT CONTROL

6.4.4.1 Descriptive Statistics

Participants intended to lose between 0.63 to 47.06 percent of their current weight over the next 12 months ($n = 105$; median (IQR) = 20.53 (14.33) % of current weight) and none of the participants' intended weight exceeded the lower limit of the healthy weight range (18.5 kg/m^2).

Respondents' scores on the Intentions to Engage in Weight Control Scale displayed a negatively skewed, non-Gaussian distribution and ranged from 10.0 to 21.0 out of a possible range of 3.0 to 21.0 points ($n = 110$; median (IQR) = 18.0 (5.0)). Three participants (2.7%) scored less than 12 points, indicating negative intentions to engage in weight control behaviour. All three items produced a corrected item-total correlation > 0.3 and the Intentions to Engage in Weight Control Scale produced a Cronbach's Alpha Coefficient of 0.64; a value that would increase to 0.80 with the removal of 'I intend to achieve my 12 month goal weight by taking part in physical activity'. Scores on the Intentions to Engage in Weight Control Scale were significantly and positively correlated with weight control goals ($n = 105$; $r_s = 0.467$; $p < 0.001$).

6.4.4.2 Univariate Associations

Intentions to Engage in Weight Control Scale score was significantly and positively correlated with HBen subscale scores, SABen subscale scores, and ORKS-10 scale scores in univariate analyses (Table 6.7). However, no significant correlation was observed for Cost subscale scores. Intentions to Engage in Weight Control Scale score was also positively associated with Health as a Value Scale scores and the SF-12 Physical Component Summary scale scores, and negatively associated with age (Table 6.7). It was also revealed that women displayed stronger intentions to engage in weight control along with those individuals with White Collar occupations (Table 6.7). Due to the high proportion of White Europeans compared to Non-White Europeans, the association between ethnicity and intentions is not assessed.

Table 6.7 Intentions to Engage in Weight Control Scale Score, Obesity Outcome Expectancy Scale Score, Sociodemographic and Health-Related Characteristics Univariate Associations

		Intentions to Engage in Weight Control Scale Score
ORKS-10 Scale Score		n = 109; r_s = 0.220; $p < 0.05$
OBEx-15	**HBen Subscale Score**	n = 110; r_s = 0.197; $p < 0.05$
	SABen Subscale Score	n = 109; r_s = 0.288; $p < 0.01$
	Cost Subscale Score	NS[a]
Health Value Scale Score		n = 108; r_s = 0.270; $p < 0.01$
Age		n = 109; r_s = -0.196; $p < 0.05$
Self-Report BMI		NS
SF-12	**PCS-12 Score**	n = 106; r_s = 0.260; $p < 0.01$
	MCS-12 Score	NS
Percent Weight Change Since Entry at Clinic		NS
Gender		Z = -2.303; $p < 0.05$ Female: median (IQR[b]) = 18.0 (4.25) Male: median (IQR) = 16.0 (4.0)
Marital Status[c]		NS
Education Level[c]		NS
Social Class[c]		Z = -2.087; $p < 0.05$ Blue Collar: median (IQR) = 17.0 (2.75) White Collar: median (IQR) = 19.0 (4.0)

[a]NS = non-significant
[b]IQR = Interquartile Range
[c]Collapsed, dichotomous variables used as described in Section 6.3.4.2

6.4.4.3 Multivariate Analyses

6.4.4.3.1 Main Multiple Regression Analysis

In order to investigate the extent to which obesity outcome expectancies predict weight control intentions whilst controlling for the potentially confounding factors, a multiple regression analysis was conducted with Weight Control Intentions Scale scores as the dependent variable. Based upon the univariate associations displayed in Table 6.7, sex, age, and SF-12v1 Physical Component Summary (PCS-12) scores were selected as potentially confounding factors and entered as independent variables in step one, followed by ObEx-15 subscale scores and ORKS-10 scale scores in step two.

Descriptive statistics for all dependent and independent variables were inspected and were found to have no out-of-range values and reasonable distributions. As no variable was missing more than 5% of cases, t-tests and Chi-squares were not requested to investigate whether the missing values were related to any other variable. Although one case was considered to represent significant univariate outlier by producing standardized scores on the HBen less than -3.29 ($p < 0.001$, two-tailed test), and also a multivariate outlier by producing a Mahalanobis distance greater than $\chi^2(8) = 26.125$ ($p < 0.001$), it was retained in the data-set in order to maximise the sample size. Its effect on the solution was, however, investigated post-hoc.

As cases with missing values on these variables were excluded from the multiple regression, this analysis was conducted on a sample size of 105. All continuous variables, with the exception of age, were found to have significantly skewed distributions (One-Sample Kolmogorov-Smirnov Test; $p < 0.001$). When these variables were reflected as appropriate and subjected to a square root or log transformation, they continued to display significantly skewed distributions and so untransformed variables were entered into the multiple regression analysis.

The multiple regression analysis revealed that variables entered in step one explained 11.8% of the variance in scores (Table 6.8), although none of the partial regression coefficients were statistically significant. When entered in step two, the obesity outcome expectancy scale scores explained a further 12.6% of the variance (Table 6.8). The partial regression coefficients was statistically significant for the SABen subscale scores ($B = 0.117$, $t_{104} = 2.314$, $p < 0.05$) and Cost subscale scores ($B = 0.088$, $t_{104} = 2.273$, $p < 0.05$) indicating that stronger intentions to engage in weight control behaviour over the next 12 months were associated with stronger endorsement of the social and aesthetic benefits of weight control and stronger rejection of the costs of and barriers to weight control.

Table 6.8 Intentions to Engage in Weight Control Scale Predictive Variables*

Step	Predictors	R^2	Adjusted R^2	R^2 change	F	df_1	df_2	p
1	Sex, age, PCS-12	0.118	0.092	0.118	4.493	3	101	< 0.01
2	HBen, SABen, Cost, ORKS-10	0.244	0.190	0.126	4.477	4	97	< 0.001

**Hierarchical multiple regression; Intentions to Engage in Weight Control Scale scores as dependent variable; sex, age, SF-12v1 Physical Component Summary score (PCS-12) requested to enter as independent variables at step one, Health Benefits of Weight Control subscale (HBen) scores, Social & Aesthetic Benefits of Weight Control subscale (SABen), Costs of & Barriers of Weight Control subscale (Cost) scores, & Obesity Risk Knowledge Scale (ORKS-10) scores requested to enter at step 2.*

The scatterplot of residuals against predicted Intentions to Engage in Weight Control Scale scores indicates an absence of outliers in solution, and that the assumptions of normality, linearity and homoscedasticity are broadly met.

6.4.4.3.2 Post-hoc Investigations

When the main multiple regression analysis was re-run with the case identified as a univariate and multivariate outlier deleted from the data-set, the solution was not significantly altered. The variables entered in step one explained 11.7% of the variance in scores, although none of the partial regression coefficients were statistically significant. The obesity outcome expectancy scale scores explained a further 12.6% of the variance, with SABen subscale and Cost subscale scores displaying significant partial regression coefficients.

To assess the impact of including PCS-12 scores as a confounding factor on the predictive ability of the health-related outcome expectancy variables, the main multiple regression analysis was also re-run, but including age and sex as confounding factors only. Due to missing values on the PCS-12 variable, this allowed data from 108 participants to be included in the analysis. Although the obesity outcome expectancy scale scores explained a slightly higher proportion of the variance (14.3%), SABen subscale and Cost subscale scores continued to represent the only variables which independently predicted a significant proportion of the variance. However, the removal of PCS-12 scale scores also allowed the partial regression coefficient of age in step one to reach significance ($B = -0.50$, $t_{107} = -2.090$, $p < 0.05$), indicating that stronger intentions to engage in weight control behaviour over the next 12 months were also associated with being younger. Once again this solution was not significantly altered when the multiple regression analysis was re-run with the case identified as a univariate and multivariate outlier deleted from the data-set.

Due to the nature of multiple regression, cases with missing values are excluded from the analysis. Although substituting missing value estimates would increase the available sample size, Tabachnick and Fidell recommends repeating the analysis both with and without missing value estimates [91]. To investigate the impact on the solution of retaining cases, the multiple regression analyses were also run on a data-set in which missing values were substituted using estimates generated by the expectation maximization method [91]. Regardless of whether PCS-12 scores were or were not included as a confounding factor, or whether the case with the univariate outlier was retained or omitted from the analysis, the obesity outcome expectancy variables continued to explain a significant proportion of the variance, between 14.5 and 15.2%, while SABen subscale and Cost subscale scores continued to represent the only variables which were independently predictive.

6.5 CHAPTER SIX DISCUSSION

6.5.1 AIM ONE

As hypothesised, obese patients attending weight management clinics strongly endorsed the social and aesthetic benefits of weight control and the costs of and barriers to weight control. However, when compared to community samples, these participants did not demonstrate significantly stronger endorsement of the health benefits of weight control, nor did they know more about the health risks associated with obesity.

Although direct experience of the impacts of obesity was postulated to influence endorsement of the benefits of weight control, participants' low scores on the HBen subscale and the ORKS-10 scale seem to be at odds with the observation that they demonstrate poor self-perceived, particularly physical health, and that many participants are suffering from diagnosed chronic health problems which would directly benefit from weight control. As Fishbein and Ajzen point out, descriptive beliefs, those resulting from direct experiences with a given object, are usually held with maximal certainty [51]. This finding is, however, in contrast to participants' scores on the SABen subscale of the ObEx-15 which appear to be consistent with a sample who may, although this study cannot confirm, be experiencing the negative social and aesthetic effects of their obesity. This perhaps says something about how apparent the links between obesity and its impacts are to the participants. The social and aesthetic impacts arise out of the visual aspects of excess adiposity, are manifested externally and occur speedily. The health impacts, however, arise internally are often asymptomatic and silent for a long time. As Slovic points out, when individuals are evaluating risks, they seldom have access to statistical evidence and so must rely on inferences based on what they remember hearing or observing [230]. One inferential rule, or heuristic, that can guide an individual's evaluation of risk, is that, if an event is easy to imagine or recall, it is more likely to be perceived as likely or frequent – or out of sight, out of mind [230].

This suggests that, while the link between obesity and social and aesthetic impacts may be all too evident, education is required to allow individuals to comprehend the less obvious, hidden relationship between obesity and health. However, despite having attended a hospital out-patient weight management clinic for a median of 18 months and, therefore, having regular contact with specialist health professionals, participants are displaying low levels of knowledge. This raises serious concerns regarding the information being conveyed, or rather not being conveyed, to patients regarding their current medical conditions and the risk associated with being obese or morbidly obese. Not only is this apparent lack of understanding regarding the health risks of obesity and the health benefits of weight control concerning in light of the postulated role of outcome expectancies in promoting health-enhancing behaviour, but also in terms of patients' ability to make informed choices regarding their health.

Although around a quarter of the sample for whom data was available had achieved or exceeded the recommended weight loss of 10% of bodyweight [32] since entering the weight management clinic, the majority of participants had as yet failed to lose this much. Just under a quarter had actually gained weight. Taken alongside the fact that these participants can all be classified as obese, and therefore have had direct experience of failing to manage bodyweight successfully in the past, it is perhaps not surprising that this sample displayed endorsed the costs of and barriers to weight control to avoid obesity [51].

6.5.2 AIM TWO

These descriptive findings suggest that this sample of obese participants would benefit from some kind of intervention that would increase their knowledge and strengthen their beliefs in the impact of obesity on health and the benefits of avoiding obesity, and reduce perceived costs and barriers involved in engaging in weight control behaviour. However, this supposition rests upon the premise that engagement in weight control behaviour would be enhanced by manipulating these constructs. As discussed in Section 3.4.5, cross-sectional data comparing potential determinants with outcomes is insufficient to claim a causal relationship. However, the case for causality becomes more compelling if differences in potential determinants are shown to predict future behaviour. To this end, the relationship between obesity outcome expectancies and intention to engage in weight control behaviour, as a proxy for actual behaviour, was investigated using both univariate and multivariate statistics.

As could be expected of a sample attending a weight management clinic, the vast majority of participants reported positive intentions to engage in weight control behaviour. As hypothesised, in univariate analyses, intentions were positively associated with endorsement of the health, social and aesthetic benefits of weight control and more knowledge regarding the health effects of obesity. However, stronger intentions were not significantly associated with rejection of the costs and barriers of weight control as predicted.

While these findings support the opinion that obese participants would benefit from some kind of intervention that would increase their knowledge and strengthen their beliefs in the impact of obesity on health and the benefits of avoiding obesity, reducing perceived costs and barriers involved in engaging in weight control behaviour, is less well supported.

However, it is clear from the univariate correlations reported in Table 6.7 that intentions were also significantly predicted by a number of sociodemographic and health-related characteristics which potentially represent confounding factors. For example, although age is significantly and positively correlated with intentions in the present study, and has previous been significantly and positively associated with obesity outcome expectancy scores (see section 4.4.3.5.4 and 5.5.3.6.2), this does not prove that the effect of age is mediated by the cognitions. In addition, due to its significant association with weight control intentions and its postulated influence on beliefs, self-perceived physical health also represents a potential confounding factor. Although engaging in health-enhancing behaviour has previously been associated with factors such education level [55] and marital status (e.g. [231]), these were not considered to represent significant confounding factors as non-significant univariate associations were found in the present study.

Although it might be expected that past behaviour, as represented by percent weight change since entry to clinic, would be positively associated with strength of intentions, this was not found to be the case. Although this was, therefore, not considered to represent a significant confounding factor, it is important to recognise that this variable is limited by the fact that it does not capture the often dynamic nature of weight loss, with its repeated small successes and failures. It also does not consider whether the individual feels that they have succeeded or failed. Future studies may, therefore, benefit from a more reliable measure of past behaviour.

In order to provide some control for the effects of potentially confounding factors, a hierarchical multiple regression analysis was conducted to eliminate the influence of age, sex and self-perceived physical health. Unfortunately, the amount of missing data on social class prohibited its inclusion, despite the significant univariate correlation. Once again, future studies may benefit from a more reliable measure of this variable. The hierarchical multiple regression analysis revealed that while obesity outcome expectancies, as measured by the ObEx-15 subscales and the ORKS-10 scale, predicted a significant proportion of the variance, strength of intentions to engage in weight control behaviour were only independently associated with beliefs in the social and aesthetic benefits of weight control and the costs and barriers to weight control.

While beliefs in the health benefits of weight control and knowledge or the health effects of obesity are associated with intentions in univariate analysis, they are not significantly associated in multivariate analysis. Although it is important to recognise that, while hierarchical multiple regression analysis affords rigorous control of potentially confounding factors, it does mean that while over-lapping variance is accounted for by the total variance predicted by the combination of obesity outcome expectancy measures entered into step 2, only unique variance is considered for the individual variables. The individual outcome expectancy variables show a number of significant univariate correlations (Table 6.6), perhaps reflecting some general attitude to weight control, which makes it difficult for them individually to significantly contribute to prediction. Therefore, this conservative method of analysis may not be sensitive enough to capture the contribution of health cognitions.

Despite this it is clear, from both univariate and multivariate analyses, that beliefs in the social and aesthetic benefits of weight control were the leading predictor of intentions to engage in weight control behaviour. This clearly illustrates Stroebe's point that even health-enhancing behaviours are frequently undertaken for reasons unrelated to health [62] and supports the opinion that obesity is primarily considered to be a social or cosmetic issue [189, 190]. What is perhaps surprising is that this should be the case for a sample whose health is seriously compromised by their bodyweight.

In previous research, obese men and women from a large telephone survey of 1431 US adults who claimed that they were trying to lose weight, cited health reasons as the most important motivator more often than individuals with BMI < 26 kg/m^2 [232]. To some extent, this appears reasonable as individuals with a BMI < 26 kg/m^2 have relatively little to benefit in terms of health when compared to individuals with a BMI ≥ 30 kg/m^2. Contrary findings were, however, published by Reas, Masheb and Grilo who demonstrated that although 64% of their participants - obese clinic patients with Binge Eating Disorder (BED) - cited health as their primary reason for seeking treatment, those who cited appearance had significantly lower Body Mass Indices (mean = 34.8 vs. 38.5 kg/m^2 respectively) [233]. This was also found in a study conducted by Masheb and Grilo involving 130 BED patients with a mean BMI of 37.2 kg/m^2 [234]. A large survey of 1891 obese Italian patients seeking treatment at medical centres preferentially treating obese patients with medical comorbidities, revealed that present health was the most important motivation for weight loss (51.5%), followed by future health (33.4%) and then by appearance (15.2%) [235]. They also revealed that women with lower BMIs were significantly more concerned with appearance than women with higher BMIs, although this was not found among males [235]. Considering that in the present study, the mean BMI of participants was 45.3 kg/m^2, one might, therefore, have expected health to dominate.

Although several other studies have been cited as demonstrating that health is the predominate motivator for weight loss attempts, these interpretations are often severely flawed. Hankey, Leslie and Lean [236] suggest that a UK study conducted by Matthews, Campbell and Webber [237] demonstrates that health was the most cited reason for weight loss for obese clinic attendees. This interpretation is purely speculative since participants could provide multiple responses and it is possible that the proportion of participants endorsing either 'to improve health generally' (30%) or 'to help with a specific medical condition' (30%) would not exceed the 35% of their 43 participants who cited 'to feel happier with appearance'. Hankey, Leslie and Lean [236] also cite a study by Roberts and Ashley involving individuals attempting weight control in primary care [238] as supporting health as the primary motivator. This interpretation is, however, derived from qualitative data from 18 participants and is an unfortunate example of 'quasi-quantification' [239]. Nevertheless, Hankey, Leslie and Lean do report some sound data of their own in which 91 overweight and obese men, who had volunteered to participate in a work-site-based weight loss intervention, gave health benefits as the main reason for wanting to lose weight [236].

There is, however, some evidence that the saliency of health and appearance motivators in weight loss attempts is influenced by age. Although, in Hankey, Leslie and Lean's study, appearance represents the second most important reason overall, in the subset of younger men (<40 years) it emerges as equally, if not more, important than health [236]. Putterman and Linden demonstrated that women who reported dieting for primarily health reasons were significantly older than women who reported dieting for mixed health and appearance reasons, both of whom were significantly older than women citing primarily appearance reasons [240]. Dalle Grave *et al.* also revealed that younger women were significantly more concerned with appearance than older women, although this was not found among males [235]. However, it is interesting to note that Reas, Masheb and Grilo did not find any difference in age between those citing health or appearance motivators in their clinic sample [233].

Several pieces of evidence also suggest that motivator saliency is influenced by gender. While Hankey, Leslie and Lean's sample of overweight and obese men cited health benefits as the main reason for wanting to lose weight [236], the scores from Ogden's study involving obese and formerly obese women attending a UK slimming club suggest that health and attractiveness motivators are equally important [148]. Considering the different study designs, this interpretation must be treated with extreme caution. Levy and Heaton, however, reported that US women who are trying to lose weight are more likely to cite appearance as the most important reason, while men are more likely to cite health [232]. In addition, Tinker and Tucker reported that among 21 individuals who had previously been obese but had lost weight without lay or professional treatment, men were significantly more likely to report health problems or concerns as motivators than women [241]. Similarly Colvin and Olson and Klem *et al.* found that men who had successfully maintained a substantial weight loss over several years, cited medical reasons as triggers for weight loss significantly more often than women [242, 243]. In contrast a gender difference was not observed in Reas, Masheb and Grilo's clinic sample [233].

Although by no means conclusive, these results suggest that the relationship between outcomes and intentions in this study has the potential to be influenced by the sample's age and gender distribution. In addition to the significant univariate correlations, this justifies the inclusion of these variables as potentially confounding factors in the hierarchical multiple regression analysis. In particular, it is important to be able to say that the dominant role of beliefs in the social and aesthetic benefits of weight control is not due to the present sample being predominately female.

While the studies described above provided some support for the contention that health is the primary motivator for weight loss, and appear to conflict with the findings from the present study, it is important to recognise that they have several important limitations. For example, asking directly about motivations requires participants to be sufficiently reflective so that the perceived and expressed motivation is comparable to their true motivations. Participants also have the potential to be strongly influenced by perceptions regarding the social acceptability of reasons, particularly in the medical setting. In addition, other factors may also bias responses, for example males may be less able to admit their motivation is an 'un-masculine' preoccupation with appearance than females. By matching *non-personalised* beliefs regarding obesity outcome expectations to intentions, as in the present study, participants are not relied upon to identify their motivations and, hopefully although this can not be confirmed, be less influenced by perceptions regarding social desirability. It is also notable that these studies do not, with the exception of Ogden [148], assess the relative strength of the motivation force produced by the outcome and have relied upon a single question in order to assess motivations; as discussed in Section 2.4.1, the extent to which complex constructs can be reliably assessed using a single item is unpersuasive.

But why could social and aesthetic considerations be more salient than health in the present sample? One possible explanation for health cognitions' relatively poor predictive ability may lie in possible moderating factors such as health saliency. So, is good health just not important to the participants? It is clear from the univariate analyses that health value is significantly and positively correlated both with intentions to engage in weight control behaviour and obesity outcome expectancies; lending support for a possible moderating role. Although these participants demonstrate a range of health values, due to the size of the available sample the role of HBen subscale and ORKS-10 scale scores in sub-samples of participants with different degrees of health value can not be determined. However, if health cognitions were more predictive in those with higher health values, this would suggest that any attempts to modify health cognitions would need to be accompanied by modification of, or at least evaluated with reference to, health saliency.

Another possible reason for health cognitions poor predictive ability could be the relatively low variability in HBen subscale and, particularly, ORKS-10 scale scores seen within this sample. Variability is essential for allowing correlations to emerge. Interestingly, the lack of variability of the ORKS-10 scale scores is not due to a ceiling effect, suggesting that in future research variability in health knowledge could be introduced into the study using an educational intervention. Scores on the Health Benefits of Weight Control subscale, however, do demonstrate a ceiling effect, as it did in the community sample (see Chapter Five). As variance cannot, therefore, be introduced into the sample in future research by manipulating beliefs, further validation work may be required for this instrument. This recommendation is supported by the fact that the HBen subscale did not prove to be either unidimensional or reliable according to standard criteria in the developmental work.

In addition to the predictive role of cognitions regarding the positive aspects of weight control to avoid obesity, this study also investigated perceptions regarding the costs of and barriers to weight control behaviour. Contrary to the hypothesised relationship, in univariate analysis, stronger intentions were not significantly associated with rejection of the costs and barriers of weight control. However, once confounding factors were controlled for, lower scores for the Costs of and barriers to weight control behaviour domain were significantly associated with stronger intentions. Health promotion campaigns would, therefore, potentially benefit from messages that seek to dispel the disadvantages associated with weight control attempts.

6.5.3 STUDY STRENGTHS & LIMITATIONS

6.5.3.1 Sample & Data Collection Procedures

Although a useable response rate of just over 54% was obtained, it is possible that it was adversely affected by the length of the questionnaire and the fact that participants were recruited onto a longitudinal study that required the completion of a second questionnaire after a period of 12 months - features that increase respondent load. The response rate may have also been adversely affected by the fact that participants' medical records, and the confidential and sensitive information contained within them, were to be reviewed by a non-clinical researcher.

While the majority of individuals approached were sufficiently motivated to complete and return the questionnaire, a significant proportion did not, which may have important effects on the representativeness of the sample. Although the sample used in the multivariate analyses did not differ significantly from the sample of individuals invited to participate in terms of gender, it is not possible to determine the extent to which they differ in other factors. For example, it may be that those individuals who perceive themselves as less likely to successfully manage their bodyweight would be less likely to participate in the study.

In addition to the potential effect on the study's response rate, other aspects of the data collection methodology may have had an effect on the questionnaire responses. For example, this study differs from other applications of the ORKS-10 scale and ObEx-15 scale in that questionnaires were not anonymous and so responses may be more likely to be subject to social desirability bias. This has important implications when comparing results across studies.

6.5.3.2 Missing Data & Substitutions

It is an important strength of the study that the multiple regression analysis was conducted on a sample that exceeds the recommended minimum of 10 cases per variable [206]. However, due to the nature of this method, the sample involved in the multivariate analysis was smaller than that involved in the descriptive and univariate analyses. As the proportion of participants excluded is relatively high, it is important to determine whether the multiple regression solution is significantly influenced by these cases. The fact that the obesity outcome expectancy measures, and particularly beliefs regarding the social and aesthetic benefits of weight control, consistently predict intentions in the post-hoc investigations, lends support for the stability of the solution. It is also an important observation that the inclusion of SF-12 Physical Component Scores did not over-control the impact of health cognitions on intentions.

6.5.3.3 Measures

6.5.3.3.1 Self-Reported Body Mass Index

An important limitation of this study is the use of self-reported Body Mass Index, which is perhaps incongruous for a population for whom clinical data is available. Self-reported Body Mass Index, particularly among the obese, has been shown to be subject to bias [5] and individuals that under- or over-estimate their Body Mass Index may differ systematically in some important way. Although a more objective assessment could have been achieved if participants completed a questionnaire at their clinic appointment and then their weight, as measured by the clinician, was recorded, this has several important limitations. Completing a questionnaire in the presence, or at least in the vicinity, of a researcher may influence social desirability bias and patients are, perhaps surprisingly, not automatically weighed at their clinic appointment. The decision to weigh an individual is based upon their preference and level of distress, and to alter this approach would have important ethical implications.

6.5.3.3.2 Intentions to Engage in Weight Control Scale

The three items developed for the Intentions to Engage in Weight Control Scale were based upon those used by Sejwacz, Ajzen and Fishbein [244]. Although the items specified the action, time and target, although not context, of the intention in question, as described by Ajzen and Fishbein [53], the action component, as in previous research involving overweight or obese individuals [114, 244, 245], was defined as 'reduce weight'. However, for some obese participants weight loss may be highly unlikely, while 'maintain weight' would represent a legitimate outcome; being both feasible and offering significant health advantages compared to continual weight gain [32]. To take into account the different outcomes that a participant may intend to achieve, and to make the items more personally salient, the action was defined as 'achieve my 12 month goal weight' – a weight which the participant had previously specified. This approach is similar to that employed by Bagozzi and Edwards in a sample of undergraduate, and therefore presumably predominately normal weight, students [246]. In addition, to improve the items' understandability, 'adhere' was substituted with 'stick to' and 'engage' with 'take part in'.

The majority of previous studies have employed single items in order to assess intentions to engage in weight control [114, 244, 245]. However, as discussed in Section 2.4.1, the extent to which complex constructs can be reliably assessed using a single item, and the extent to which a single item can produce enough variability in scores for a multiple regression analysis, is unpersuasive. An exception is Bagozzi and Edwards' two intention items which, although were entered as separate indicators in their structural equation model, displayed adequate reliability (ρ = 0.85) [246]. The items, however, appear to be unnecessarily complex, which although may have not been an issue for their sample of undergraduate students, would have important implications for less well-educated samples. In addition, these items, along with the majority of studies, do not specify how the outcome is to be achieved, just that the outcome will be achieved. An exception to this is the study by Sejwacz, Ajzen and Fishbein who, although treated each item as a separate variable, reported that responses to 'I intend to adhere to a diet to reduce weight during the next two months' and 'I intend to engage in physical activity to reduce weight in the next two months' were highly correlated with 'I intend to reduce weight in the next two months' [244]. By adding specificity to the intentions, it is easier to write a set of related items.

Although the psychometrics of Intentions to Engage in Weight Control Scale have not been established prior to this research, the scale produced a good spread of scores, even with the expected negative skew, which was notably better than the single 'I intend to achieve my 12 month goal weight' item. It is also encouraging that the scale produced a Cronbach's Alpha Coefficient which approached the standard cut-off of ≥ 0.7 despite only three items being involved. Although the corrected item-total correlation exceeded the 0.3 cut-off, the fact that the overall scales' internal consistency would have been improved with the removal of 'I intend to achieve my 12 month goal weight by taking part in physical activity' raises some questions regarding this item. Although the term 'physical activity' was retained from the original item developed by Sejwacz, Ajzen and Fishbein, in retrospect, 'being more active' may be less exercise- or sport-orientated and, therefore, better encompass the many strategies that sedentary obese people can employ to increase their energy expenditure. A similar observation can be made regarding 'sticking to a diet' which may have been better replaced with 'change my diet' or 'change what I eat'. Participants may not, and hopefully do not, view their proposed eating behaviour as a short-term regime but as a lifestyle change. Further research would, therefore, be required to enhance the scale's psychometric properties.

6.5.3.3.3 Health-Related Quality of Life

In order to investigate and control for subjective health-related quality of life, participants completed the 12-item Short Form Health Survey Version 1 (SF-12v1) Standard Form (4-Week Recall). In addition to its satisfactory psychometric properties and its previous successful use in obese populations, it is relatively short, thereby minimising respondent load. Although there are obesity-specific quality of life scales, such as Karlsson *et al.*'s short, unidimensional, reliable and valid Obesity-Related Problems Scale [247], which have the potential to capture aspects that are the most important to the participants, the items themselves are very similar in content to items included in the ObEx-15 scale. While this supports the ObEx-15's content validity, as Ogden reasons, comparing responses to items of a similar content has the potential to produce false positive associations [248].

6.5.4 IMPLICATIONS & FUTURE RESEARCH

As the health of the participants of this study, both in terms of current health and future risk, would undoubtedly benefit from weight control, the results of this study suggest that modifying obesity outcome expectancies could play an important role in weight management treatment. Although it may be argued that the proportion of variance explained is relatively low, it is important to recognise that outcome expectancies are but one construct implicated in health behaviour decision making. Previous research has demonstrated that even broad combinations of constructs predict relatively small proportions of the variance in intentions and behaviour [74], indicating that a great deal remains to be discovered about what factors are involved in the formation of decisions to engage in health behaviours. Whilst it is clear that other factors are extremely important in the formation of weight control intentions in obese clinic attendees, it does not exclude the valuable contribution that obesity outcome expectancies may make. Exploiting this potential, however, may prove problematic as there is currently a lack of clear guidance regarding how constructs such as outcome expectancies can be successfully translated into practice [249].

As discussed in Section 3.5.1, several studies have suggested that medical professionals feel obligated to discuss health risks with obese patients (e.g. [120, 126, 144, 176]) and use it as their primary treatment approach [124]. The results of this study, however, suggest that this might not represent the most effective method of promoting behaviour change. Health professionals working with the obese, might instead find it more productive to focus upon beliefs in the social and aesthetic benefits and the costs of and barriers to weight control.

However, even before an obesity outcome expectancy-based intervention for obese weight management clinic attendees can be developed, it is important to confirm that their cognitions not only predict intentions, but also predict future behaviour. As discussed in Section 6.1, although behavioural intentions are considered to represent the immediate determinant of behaviour [53], they are not perfectly correlated [66]. Fortunately the data presented in this chapter represent the base-line of an on-going longitudinal study designed to track participants' weight change over a 12 month period. It would also be appropriate to ensure that these results were replicable in a separate sample of obese clinic attendees, and to ensure that the correlation between obesity outcome expectancies and intention is constant across the spectrum of weight loss. In addition, once such an intervention has been designed, not only would it be important to confirm that it modifies cognitions, but also that these modifications result in appropriate behaviour change, preferably using a randomised controlled trial [250].

6.6 CHAPTER SIX CONCLUSION

This study has revealed that, despite frequent contact with health professionals, obese clinic attendees demonstrated low levels of knowledge regarding the health risks associated with obesity. This has clear implications for their ability to make informed decisions regarding their health. This study has also demonstrated that obesity outcome expectancies are associated with weight control intentions of obese clinic attendees. As intentions are considered to be direct determinants of behaviour, this lends some support for Expectancy Value and Subjective Expected Utility Theory. It also suggests that modifying obesity outcome expectancies has the potential to play an important role in obesity treatment. Although, as discussed in Section 3.5.1, obesity treatment and management strategies to-date appear to be focused upon positive health-related outcome expectancies, the results of this study suggest that health professionals working with the obese, might find it more productive to focus upon beliefs in the social and aesthetic benefits and the costs of and barriers to weight control.

CHAPTER SEVEN: DISCUSSION

In Chapter One it was established that the condition of obesity, classified by a BMI ≥ 30.0 kg/m^2, is a risk factor for a wide range of significant physical, psychological and social problems. As the prevalence of obesity in the UK is currently high and likely to increase in the future, immediate and concerted action is required to prevent and treat this condition. Individuals can exert volitional control over their eating and physical activity behaviour and their environments and, therefore, have an important role to play in treating and preventing obesity.

Social cognition theory, as described in Chapter Two, suggests that behaviour which occurs in a social context, such as eating and physical activity, is not directly determined by the external stimulus of a situation, but by mediating internal mental processes: attitudes, beliefs or knowledge. Outcome expectancies (beliefs regarding the likelihood that an outcome will occur following an action and beliefs regarding the value of that outcome) and the cost-benefit analysis described by Expectancy Value and Subjective Expected Utility Theory (the relative balance of positive and negative outcome expectancies associated with a behaviour and its alternative(s)), are thought to play a central role in the pre-decisional, motivational phase of self-regulation. They have been incorporated, along with a number of other theories, into the most widely used social cognition models (SCMs); the Health Belief Model and the Theory of Reasoned Action and its predecessor, the Theory of Planned Behaviour. They are also central to the popular Transtheoretical Model (TTM) of behaviour change.

As described in Chapter Three, several studies have demonstrated that outcome expectancies predict smoking cessation and have been manipulated successfully in cost-effective, mass-media anti-smoking campaigns. Although obesity outcome expectancies are implicated in some obesity treatment and prevention strategies, their role in predicting weight control behaviour is yet to be established. However, in order to fully determine the role of outcome expectancies in weight control behaviour, it is necessary to quantify them in some way. While psychometric scales offer a standardised and cost-effective method, if meaningful results are to be produced, it is extremely important that attention is paid to the scale's psychometric properties. Obesity outcome expectancies have also been investigated in an enormous variety of studies, this construct is often very poorly defined and operationalised. The lack of universally accepted, psychometrically sound measures of obesity outcome expectancies has meant that authors rarely use items again in future research. This seriously limits the comparisons that can be made across studies. Such scales would, however, have a wide range of important clinical, professional and scientific applications.

Chapter Four, however, describes the development of a new, short scale to measure knowledge regarding the health risks associated with obesity. The results of the studies conducted, provide persuasive evidence for the Obesity Risk Knowledge (ORKS-10) Scale's reliability, discriminatory ability and face, content, criterion and construct validity.

Chapter Five also describes the development of a new, obesity outcome expectancy scale, this time to assess salient beliefs regarding positive and negative, health and non-health outcomes of obesity. These studies have firmly established that the Social and Aesthetic Benefits of Weight Control (SABen) and Costs of and Barriers to Weight Control (Cost) Subscale of the Obesity Outcome Expectancy Belief Scale (ObEx-15) are both reliable and unidimensional. Although the Health Benefits of Weight Control Subscale fails to reach the most stringent psychometric criteria, it does appear to have the potential to offer a useful measure of health-related outcome expectancy beliefs, over-and-above the Obesity Risk Knowledge Scale. The ObEx-15 scale has demonstrated some construct validity through its positive association with health value.

As the Obesity Risk Knowledge Scale and the Obesity Outcome Expectancy Belief Scale represent generic, psychometrically sound measures of obesity outcome expectancies, they were subsequently used in a study which aimed to examine beliefs and knowledge in a sample of obese clinic attendees and to determine whether strength of intention to engage in weight control behaviour will be significantly associated with obesity outcome expectancies. As described in Chapter Six, obese clinic attendees demonstrated low levels of knowledge regarding the health risks associated with obesity which has important implications for their ability to make informed decisions regarding their health. Obesity outcome expectancies also predicted weight control intentions. Intentions are considered to be direct determinants of behaviour and this lends some support for Expectancy Value and Subjective Expected Utility Theory. It also suggests that modifying obesity outcome expectancies has the potential to play an important role in obesity treatment. Although, obesity treatment and management strategies to-date appear to be focused upon positive health-related outcome expectancies, the results of this study suggest that those working with the obese might find it more productive to focus upon beliefs in the social and aesthetic benefits and the costs of and barriers to weight control.

Targeting the social and aesthetic benefits of weight control, would, however, be a highly controversial approach for obesity and in complete contrast to treatment programmes such as 'If Only I Were Thin...' which aims to improve participants' quality of life and mental health through techniques which include re-defining beauty with regard to fatness and challenging anti-fat attitudes, both internally and externally [251]. While such an approach may promote weight loss for these individuals, by conforming to anti-fat attitudes, in the long term, it strengthens them. As Stunkard and Sobel observe "...*obesity* does not create a psychological burden. Obesity is a physical state. *People* create the psychological burden" (p417, [252]). Strengthening anti-fat attitudes may, therefore, result in higher rates of obesity-related psychological comorbidity – an undeniably inappropriate outcome for health promotion.

Although size acceptance may lessen psychological comorbidity, it has less positive implications for physical comorbidity. The opposite can be said for an intervention aiming to promote the social and aesthetic benefits of weight control. Unfortunately, although promoting the health benefits of weight control would not seem to have the same potential for increasing psychological comorbidity, it does not predict weight loss behavioural intentions and, therefore, the potential for improvement in physical health.

It is interesting to reflect upon the recent approach to mass-media anti-smoking messages adopted by National Health Service. Since August 2005, the Motivations that Matter campaign has emphasised a smokers' desirability as a partner, attractiveness and sexual performance [202]. For example, a television advert depicts a young man approaching an attractive girl in bar following a period of flirtatious eye-contact. As he walks towards her, he notices that she is smoking and pulls away with a look of disgust. The girl is then shown sitting alone and looking disappointed with the words 'If you smoke, you stink' displayed on the screen (Figure 7.1). Bill-board posters and magazine adverts have displayed young, attractive women with no physical flaws except extensive wrinkling around the mouth (Figure 7.2) or heavily discoloured teeth accompanied by the message 'Your ageing treatment by fags' or 'Your beauty treatment by fags'. Television, bill-board and magazine adverts have shown two male fingers depicting legs with a cigarette stub vividly in place of a penis (Figure 7.3). The message accompanying this image is that having smoked is a major cause of impotence.

Figure 7.1 'If you smoke, you stink' TV Advert

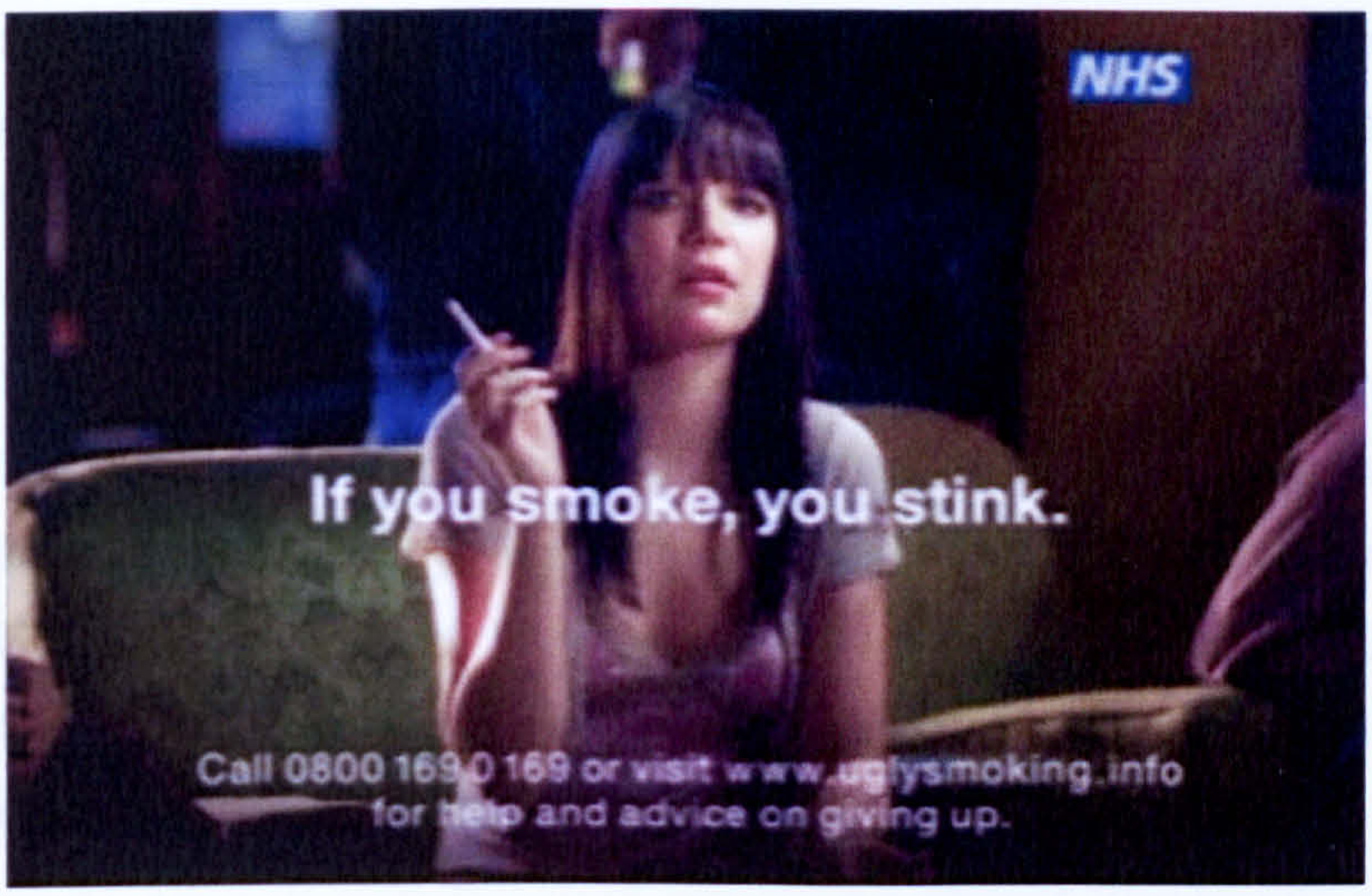


Figure 7.2 Cat's Bum Mouth Advert **Figure 7.3** Impotence Advert

In keeping with the recommendations made by Schar and Gutierrez, these 'why quit' messages are accompanied by links to information on how to quit [201]. It is, however, interesting to observe that even these maintain the hard-hitting outcome expectancy message: Text HARD to 84118, www.stayinghard.info, Text UGLY to 84118, www.uglysmoking.info.

As described in the Health Development Agency's report 'A Breath of Fresh Air: Tackling Smoking Through the Media', previous campaigns Government mass-media, anti-smoking campaigns have used qualitative investigation to developed salient messages and pre-test images [192]. Therefore, presumably the focus on social and aesthetic issues in the present campaign really do reflect 'motivations that matter' and are acceptable to the target audience. This information, if it exists, has, however, not been published. It will also be interesting to review any post-test evaluation to determine whether this strategy is engaging, acceptable and above all effective. In addition, questions need to be asked regarding the sort of effects that these images have on non-smokers. For example, does the slightly mocking tone of the Staying Hard campaign increase the emotional distress suffered by impotent men and does the emphasis on physical perfection and fear of aging reinforce societal stereotypes?

Considering the results of study described in Chapter Six, future research might usefully seek to explore the acceptability of the kind of images used in the Motivations that Matter campaign, for obesity. What do individuals, both obese and non-obese, feel about focusing upon social and aesthetic outcomes? The use of social and aesthetic outcomes will, however, also depends upon whether, as Cheskin and Donze question, if an individual is motivated to change his or her behaviour, does it matter what drives this? [253]. According to self-determination theory, motivation that is underpinned by an individual's focus on approval from others is less likely to result in behaviour change [254]. This has been supported by research which has demonstrated that participants of a 6-month, very-low-calorie weight loss program whose motivation for weight loss was more autonomous, attended the program more regularly, lost more weight during the program and maintained greater weight loss at follow-up [255].

But, as Cheskin and Donze once again question, is motivation derived from extrinsic societal pressures better than no motivation at all? There are two possible areas of concern – whether extrinsic motivation promotes weight loss desires that conform more to the media-driven 'thin ideal' and less to the more conservative medical weight-loss recommendations, and whether extrinsic motivation promotes unhealthy weight loss practices. Masheb and Grilo have demonstrated that in their sample of 130 Binge Eating Disorder patients with a mean BMI of 37.2 kg/m^2, disappointed, acceptable, happy and dream weight loss expectations did not differ according to whether the primary motivation was cited as appearance or health [234]. However, as discussed in Section 6.5.2, asking directly about motivations is associated with several limitations. It requires participants to be sufficiently reflective to give an accurate response. Furthermore, in this study a single question is used in order to assess motivation which has the potential for significant measurement error. The Obesity Risk Knowledge Scale and the Obesity Outcome Expectancy Belief Scale would, however, provide useful tools by which to investigate the extent to which weight control outcome expectancies predict weight loss expectations.

More disturbing is a recent study by Putterman and Linden who described the dieting strategies of 110 female students and 96 community women who were not on average overweight but who were currently dieting, in relation to whether their motivation for weight loss was appearance or health-related [240]. They found that the if a participant's dieting was motivated by appearance, she was more likely to report using unhealthy dieting strategies such as excluding entire food groups, taking laxatives or vomiting. She was also more likely to display dietary restraint and disinhibition – factors associated with overeating in times of anxiety or stress. In contrast, dieting for yourself rather than others was positively associated with healthful eating behaviours. They suggest that perhaps focusing one's efforts on health-related outcomes and goals can serve as a protective factor against the dangers of dieting. Once again the Obesity Risk Knowledge Scale and the Obesity Outcome Expectancy Belief Scale would provide useful tools to conduct further research with obese participants.

It is clear, therefore, that despite the provisional results of the study described in Chapter Six, focusing upon the social and aesthetic benefits of weight control has potentially some serious limitations. But what else is to be done if health issues truly are not motivating? Of particular interest might be the focus upon impotence in the Motivations that Matter anti-smoking campaign, which has both social and medical implications. As Cheskin and Donze point out, obese individuals may be less motivated by relatively abstract medical constructs such as blood pressure, than they are by relevant, physical symptoms [253]. As discussed in Section 6.5.1, the health impact of obesity is often asymptomatic and out of sight can mean out of mind [230]. It is also notably that the Staying Hard images are accompanied by a mechanistic explanation of the effect of smoking on penile function. As noted in the qualitative research conducted in section 5.3.3, vivid expressions of risk acceptance were accompanied by an understanding as to how the excess adiposity was affecting health. Obesity's adverse effect on the heart, for example, may be more vivid if accompanied by an easily understood explanation as to how it has this comes about. The implications of obesity's health effects might be made more salient with images that emphasize the impact of developing, for example, osteoarthritis might have on an individual's life such as their ability to play with their children.

One thing is clear, if health, social or aesthetic obesity outcome expectancies are to be targeted it would be extremely unethical to create high levels of concern without being able to offer individuals the appropriate medical and environmental support to enable them to change their behaviour. It is an unfortunate paradox that this support will only come about when society as a whole deems it necessary; a process that will require a collective consciousness-raising regarding the implications of obesity.

The study described in Chapter Six demonstrated that fewer perceived costs of and barriers to weight control behaviour were significantly associated with stronger intentions. This suggests that health promotion could potentially utilise messages that seek to dispel the disadvantages associated with weight control attempts. This would also avoid some of the disadvantages described above which are associated with health, social or aesthetic obesity outcome expectancies. This strategy has not, however, been the focus of current obesity treatment and management or anti-smoking campaigns and potentially represents an interesting area for further research.

While the emphasis of the investigation conducted in this thesis has centred around one of the most established theories of health behaviour, it is extremely important to recognise that this is but one of a wide range of theories that may prove to be useful in the prevention and management of obesity. It is also likely to be limited by its assumption that individuals are rational information processors. In certain situations, the affective and habitual aspects may overwhelm the rational calculation of costs and benefits. While it is not likely that manipulating obesity outcome expectancies will single-handedly reverse the global obesity epidemic, it may represent an important part of the solution. Arguably the development of psychometrically sound measures of these potentially useful constructs will drive forward research in this area.

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APPENDIX ONE

OBESITY RISK KNOWLEDGE SCALE ITEM POOL EVIDENCE BASE

	Obesity Risk Knowledge Scale Item	Correct Answer	Relative Risk Estimate	Consensus Statement	Selected Primary Evidence
1	In terms of health, it is worse for a person to be obese than to smoke.	False	N/A[a]	Scottish Intercollegiate Guidelines Network 1996 [1]; National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3].	Willett *et al.* 1987 [4]; Wannamethee & Shaper 1989 [5].
2	Obesity increases the risk of developing diabetes in later life.	True	According to the World Health Organization, obesity is associated with a 'much more than 3' fold increase in the global relative risk estimate for both men & women [6]. According to the National Audit Office, the relative risk estimate for the English population is 12.7 for women & 5.2 for men [7].	National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3]; House of Commons Health Committee 2004 [8]; Royal College of Physicians of London, Royal College of Paediatrics & Child Health & Faculty of Public Health 2004 [9].	Sims *et al.* 1973 [10]; Colditz *et al.* 1990 [11]; Chan *et al.* 1994 [12].
3	The medical recommendation is that obese people should loss weight slowly, around 1-2lbs (½-1kg) a week.	True	N/A	The Royal College of Physicians 1998 [13]; National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3].	N/A

[a]*N/A = Not applicable*

	Obesity Risk Knowledge Scale Item	Correct Answer	Relative Risk Estimate	Consensus Statement	Selected Primary Evidence
4	Obese people can expect to live as long as non-obese people.	False	According to the Royal College of General Practitioners, BMI 29 – 31 kg/m^2 is associated with a relative risk of death of 2.1 in non-smokers [8].	National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3]; World Health Organization 2000 [6]; National Audit Office 2001 [7]; Royal College of Physicians of London, Royal College of Paediatrics & Child Health & Faculty of Public Health 2004 [9].	Manson *et al.* 1995 [14]; Calle *et al.* 1999 [15]; Peeters *et al.* 2003 [16]; Flegal *et al.* 2005 [17].
5	Obesity increases the risk of developing breast cancer after the menopause.	True	According to the World Health Organization, obesity is associated with between 1 & 2 fold increase in global relative risk for post-menopausal women [6]. According to Calle & Kaaks, obesity is associated with a 1.5 fold increase in risk for post-menopausal women [18].	National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3]; International Agency for Research on Cancer 2002 [19]; Royal College of Physicians of London, Royal College of Paediatrics & Child Health & Faculty of Public Health 2004 [9].	Huang *et al.* 1997 [20]; Calle *et al.* 2003 [21].
6	There is **no** significant health benefit if an obese person who has developed diabetes in later life, loses weight.	False	N/A	Scottish Intercollegiate Guidelines Network 1996 [1]; National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; The Royal College of Physicians 1998 [13]; World Health Organization 2000 [6].	Lean *et al.* 1990 [22]; Goldstein 1992 [23]; Jung 1997 [24].
7	Obesity increases the risk of developing migraines.	False	No relative risk estimate published.	No consensus statement published.	No evidence published.

	Obesity Risk Knowledge Scale Item	Correct Answer	Relative Risk Estimate	Consensus Statement	Selected Primary Evidence
8	It is better for a person's health to have fat around the hips and thighs than around the stomach and waist.	True	According to the World Health Organization, a waist circumference ≥ 94 cm for men & ≥ 80 cm for women is associated with an "increased risk" of metabolic complications. A "substantially increased risk" is associated with a waist circumference ≥ 102 cm for men & for ≥ 88 cm for women [6].	National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3]; National Audit Office 2001 [7]; International Agency for Research on Cancer 2002 [19]; Royal College of Physicians of London, Royal College of Paediatrics & Child Health & Faculty of Public Health 2004 [9].	Hartz *et al.* 1983 [25]; Ohlson *et al.* 1985 [26]; Kannel *et al.* 1991 [27]; Chan *et al.* 1994 [12]; Giovannucci *et al.* 1995 [28]; Han *et al.* 1995 [29]; Rexrode *et al.* 1998 [30].
9	Rapid weight loss in obese people is **not** associated with any health problems.	False	N/A	World Health Organization 2000 [6].	Liddle, Goldstein & Saxton 1989 [31]; Shiffman *et al.* 1991[32]; Weinsier, Wilson & Lee 1995 [33].
10	Obesity increases the risk of developing a food allergy.	False	No relative risk estimate published.	No consensus statement published.	No evidence published.
11	A person with a 'beer-belly' shaped stomach has an increased risk of developing diabetes in later life.	True	According to the World Health Organization, a waist circumference ≥ 94 cm for men & ≥ 80 cm for women is associated with an "increased risk" of metabolic complications. A "substantially increased risk" is associated with a waist circumference ≥ 102 cm for men & for ≥ 88 cm for women [6].	National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3]; Royal College of Physicians of London, Royal College of Paediatrics & Child Health & Faculty of Public Health 2004 [9].	Hartz *et al.* 1983 [25]; Ohlson *et al.* 1985 [26]; Chan *et al.* 1994 [12].

Obesity Risk Knowledge Scale Item		Correct Answer	Relative Risk Estimate	Consensus Statement	Selected Primary Evidence
12	Obesity increases the risk of developing bowel cancer.	True	According to the World Health Organization, obesity is associated with between 1 & 2 fold increase in the global relative risk estimate for men & women [6]. According to Calle & Kaaks, obesity is associated with a 1.5 fold increase in risk for women & 2.0 for men [21]. According to the National Audit Office, the relative risk estimate for the English population is 12.7 for women & 5.2 for men [7].	National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3]; International Agency for Research on Cancer 2002 [19]; Royal College of Physicians of London, Royal College of Paediatrics & Child Health & Faculty of Public Health 2004 [9].	Giovannucci *et al.* 1995 [28]; Giovannucci *et al.* 1996 [34].
13	Gradual weight gain throughout adult life increases the risk of developing TB (tuberculosis).	False	No relative risk estimate published.	No consensus statement published.	No evidence published.
14	Gradual weight gain throughout adult life increases the risk of heart disease.	True	N/A	No consensus statement published to support.	Hubert et al. 1983 [35]; Manson *et al.* 1990 [36].
15	Obesity does **not** increase the risk of developing high blood pressure.	False	According to the World Health Organization, obesity is associated with between 2 & 3 fold increase in the global relative risk estimate for men & women [6]. According to the National Audit Office, the relative risk estimate for the English population is 4.2 for women & 2.6 for men [7].	National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3]; Royal College of Physicians of London, Royal College of Paediatrics & Child Health & Faculty of Public Health 2004 [9].	Stamler *et al.* 1978 [37]; Van Itallie 1985 [38]; Cairney & Wade 1998 [39].

	Obesity Risk Knowledge Scale Item	Correct Answer	Relative Risk Estimate	Consensus Statement	Selected Primary Evidence
16	Obesity increases the risk of having a heart attack (a myocardial infarction).	True	According to the National Audit Office, the relative risk estimate for the English population is 1.5 for women & 3.2 for men [7].	National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3]; Royal College of Physicians of London, Royal College of Paediatrics & Child Health & Faculty of Public Health 2004 [9].	Reuterwall *et al.* 1999 [40]; Kenchaiah *et al.* 2002 [41].
17	Obesity is more of a risk to health for people of South Asian (e.g. Indian and Pakistani) descent than people of European descent.	True	N/A	British Nutrition Foundation 1999 [3]; World Health Organization 2004 [42].	McKeigue, Shah & Marmot 1991 [43].
18	Smoking causes more premature deaths a year than obesity.	True	N/A	N/A	Ezzati *et al.* 2002 [44].
19	Obesity increases the risk of developing 'flu (influenza).	False	No relative risk estimate published.	No consensus statement published.	No evidence published.
20	It is healthier to be obese and keep the same weight than frequently gaining and losing weight ('yo-yoing' in weight).	True	N/A	No consensus statement published.	No evidence published. [b]
21	Obesity increases the risk of developing hay fever.	False	No relative risk estimate published.	No consensus statement published.	No evidence published.
22	In terms of health, it is better to stop smoking even if this results in weight gain.	True	N/A	Scottish Intercollegiate Guidelines Network 1996 [1]; National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3].	Willett *et al.* 1987 [4]; Wannamethee & Shaper 1989 [5].

[b] Evidence does, however, support the association between weight cycling and negative health outcomes (e.g. Lissner et al. 1991 [45]; Stafford, Hemmingway & Marmot 1998 [46]; Olson et al. 2000 [47]).

	Obesity Risk Knowledge Scale Item	Correct Answer	Relative Risk Estimate	Consensus Statement	Selected Primary Evidence
23	In terms of health, it is better for a person to have an 'apple' shape rather than a 'pear' shape.	False	According to the World Health Organization, a waist circumference ≥ 94 cm for men & ≥ 80 cm for women is associated with an "increased risk" of metabolic complications. A "substantially increased risk" is associated with a waist circumference ≥ 102 cm for men & for ≥ 88 cm for women [6].	National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3]; National Audit Office 2001 [7]; International Agency for Research on Cancer 2002 [19]; Royal College of Physicians of London, Royal College of Paediatrics & Child Health & Faculty of Public Health 2004 [9].	Hartz *et al.* 1983 [25]; Ohlson *et al.* 1985 [26]; Kannel *et al.* 1991 [27]; Chan *et al.* 1994 [12]; Giovannucci *et al.* 1995 [28]; Han *et al.* 1995 [29]; Rexrode *et al.* 1998 [30].
24	Obesity does **not** increase the risk of developing lung cancer.	True	No relative risk estimate published.	International Agency for Research on Cancer 2002 [19].	Calle *et al.* 2003 [21]; Drinkard *et al.* 1995 [48].
25	An obese person who has developed diabetes late in life would need to lose at least 40% of their body weight to have a significant health benefit.	False	N/A	Scottish Intercollegiate Guidelines Network 1996 [1]; National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; The Royal College of Physicians 1998 [13]; World Health Organization 2000 [6].	Lean *et al.* 1990 [22]; Goldstein 1992 [23]; Jung 1997 [24].
26	Avoiding obesity throughout adult life reduces a person's risk of developing heart disease.	True	According to the World Health Organization, obesity is associated with between 2 & 3 fold increase in the global relative risk estimate for men & women [6].	National Heart Lung & Blood Institute & National Institutes of Health 1998 [2]; British Nutrition Foundation 1999 [3]; National Audit Office 2001 [7]; House of Commons Health Committee 2004 [8]; Royal College of Physicians of London, Royal College of Paediatrics & Child Health & Faculty of Public Health 2004 [9].	Hubert *et al.* 1983 [35]; Manson *et al.* 1990 [36]; Jousilahti *et al.* 1996 [49]; Cairney & Wade 1998 [39].

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APPENDIX TWO

OBESITY OUTCOME EXPECTANCY LITERATURE

Author(s)	Date[a]	Country[b]	Participants	Format[c]	Cognition[d]	Item[e]	Response Format	Results	Psychometrics[f]
Al-Rukban 2003 [1]	2001 - 2002	Saudi Arabia	894 male students, 12-20 years	Self-admin	Knowledge	*Obesity is dangerous for health*	-[g]	87.6% responded correctly Obese (≥95th age-specific BMI centile) = 90.4% correct vs. normal weight (5th> BMI centile <85th) = 86.8% ($p<0.01$)	-
Banasiak & Murr 2001 [2]	1999 - 2000	US	81 2nd yr medical students, 24 3rd yr medical students who had completed a Bariatric Surgery rotation, 55 3rd yr medical students who had not	Self-admin	Knowledge	*Obesity is associated with all of the following EXCEPT: a. Hypertension b. Gastric cancer c. Heart disease d. Sleep apnea e. Urinary incontinence* *Medical conditions exacerbated by obesity and improved by weight loss are: a. Cardiovascular disease and Hypertension b. Sleep Apnea and Mechanical Arthropathy c. Type II Diabetes d. a. and c. e. a., b. and c.* *Which of the following is FALSE: a. The risk of Diabetes is roughly tenfold in individuals who are severely obese b. As body fat increases so does insulin resistance c. All anti-hyperglycemic agents induce weight loss d. One in four overweight individuals has insulin resistance*		Mean percentage of correct responses to all 3 items = 70% - 88% No significant differences between each of 3 samples	Validated using independent t-test by a panel of 10 4th year medical students

[a]Date of data collection; [b]Country of data collection; [c]Self-admin = self-administered questionnaire, anon = anonymous; [d]Cognition under investigation as described by author(s); [e]Italics = exact item wording, reproduced where available; [f]Psychometric properties as described by author(s); [g]- = no information available

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Barr *et al.* 2004 [3]	-	Canada	514 dieticians	Self-admin	Views on 'facts'	*Obesity is a major contributor to morbidity and mortality*	5-point; collapsed to disagree, neutral, agree	89.8% = agree	Questionnaire based upon Campbell & Crawford 2000 [4]
						An obese, fit adult has the same risk of heart disease as a lean, fit adult		57.8% = disagree	Face validity assessed by 12 dieticians with obesity-related experience
						Small weight losses can produce important health benefits		96.8% = agree	
						Only people who are very obese will gain health benefits from reducing their weight		90.4% = disagree	
Block, DeSalvo & Fisher 2003 [5]	1999 – 2000	US	87 internal medical residents	-	Knowledge	*Obesity by itself is a risk factor for cervical cancer*	True/False	74% = correct	Items based upon NHBI & NIH 1998 [6]
						Obesity by itself is a risk factor for hyperlipidemia		78% = correct	Items incorporated into a 15-item general obesity-related knowledge scale on the basis of a Rasch analysis
						Obesity by itself is a risk factor for hypertension		92% = correct	
						Obesity by itself is a risk factor for diabetes mellitus		97% = correct	
						Obesity by itself is a risk factor for sleep apnea		98% = correct	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Bocquier *et al.* 2005 [7]	2003	France	600 general practitioners	Tele-phone interview	Beliefs	Obesity is a disease	4-point; not at all to strongly	56.8% = strongly agree; 33.4% = rather agree	Questionnaire based upon literature, Basdevant, Laville & Ziegler 2002 [8] and NIH & NHLBI 1998 [6]
						Normal weight is important for health		82.3% = strongly agree; 16.9% = rather agree	
						For overweight and obese patients even small weight loss can produce health benefits		77.7% = strongly agree; 21.5% = rather agree	Reviewed by 10 experts
					Knowledge	Health risks associated with obesity in adults:			Pilot tested with 17 GPs for length, clarity & suitability
						...premature mortality	Yes / no	Nearly all recognised	
						...type II diabetes			
						...sleep apnea			
						...hypertension			
						...increased surgical risks			
						...phlebitis			
						...infertility		53% = unaware	
						...some cancers		45.5% = unaware	
					Beliefs	Rate importance of consequences:	6pt; 1 = not important to 6 = very important		
						...medical problems		Mean (sd[h]) = 4.9 (1.11)	
						...psychological problems		Mean (sd) = 4.3 (1.04)	
						...social problems		Mean (sd) = 3.8 (1.09)	
								Pairwise comparisons of means: $p < 0.05$	

[h] *sd = standard deviation*

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Brook & Tepper 1997 [9]	-	Israel	141 students, 14-18 years old	Self-admin, anon	Knowledge / attitude	Obesity is a high risk factor for poor health	-	91% believed	Validity judged by 8 experts Item included in a 19-item 'Attitudes towards obesity' subscale (Alfa Cornbach [sic] = 0.8)
Campbell & Crawford 2000 [4]	1997	Australia	400 dieticians	Self-admin	Attitude / view	*Obesity is a major cause of morbidity and mortality* *Small weight losses can produce important medical benefits* *Only people who are very overweight or obese will gain health benefits from reducing their weight*	5-point; collapsed into disagree, neutral, agree	88% agreed 92% agreed 12% agreed	Items developed from a review of literature Pilot tested by 13 dieticians with obesity-related expertise for scope, length and clarity
Campbell *et al.* 2000 [10]	-	Australia	386 general practitioners	Self-admin	Attitude / view	*Small weight losses can produce important medical benefit*	5-point; strongly disagree to strongly agree	88% agreed or strongly agreed	Questionnaire developed from review of literature and Campbell & Crawford 2000 [4] Pilot tested with 24 GPs for scope, length and clarity

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Foster *et al.* 2003 [11]	-	US	620 primary care physicians	Self-admin, anon	Attitude / Belief	*Obesity is a chronic disease*	5-point; strongly agree = 5 to strongly disagree = 1	Mean (sd) = 4.5 (0.9); 92.0% = 4 or 5 Scores not significantly associated with BMI, age, sex	Items piloted in a smaller survey of family physicians; minor modifications subsequently made
						Obesity is associated with serious medical conditions		Mean (sd) = 4.4 (0.8); 91.4% = 4 or 5 <44 years = 4.5 ± 0.7 vs. ≥ 44 years = 4.3 ± 0.8 ($p<0.001$); not significantly associated with BMI or sex	
						A 10% reduction in body weight is sufficient to significantly improve obesity-related health complications		Mean (sd) = 3.8 (0.9); 75% = 4 or 5 Scores not significantly associated with BMI, age, sex	
Green, McCoubrie & Cullingham 2000 [12]	1998	UK	17 health visitors (HV), 24 practice nurses (PN)	Self-admin, anon	Knowledge	*Which do you think carries a greater risk of metabolic diseases?* *Centrally distributed excess fat* *Peripherally distributed excess fat* *Excess body fat carries the same risks wherever it is on the body*		75.0% of PN & 35.3% of HV selected 'centrally distributed excess fat'. 17.9% of PN & 52.9% of HV selected 'excess body fat carries the same risks wherever it is on the body'.	Content validity established by test developers. Pilot study conducted on 20 student nurses, minor modifications subsequently made. Pilot study conducted on 16 qualified dieticians, data provides 'gold-standard'

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Hankey *et al.* 2004 [13]	1998	Scotland	741 general practitioners (GP), 509 practice nurses (PN), 255 dieticians	Self-admin & tele-phone interview[i]	Belief	*Hypertension is aggravated by obesity and improved by weight loss* [Agree = correct][j]	3-point; disagree, neutral, agree[k]	GP = 97% correct; PN = 95% correct; Dieticians = 95% correct No significant difference between professional groups or association with demographics	Based upon initial qualitative research & validation [14] Critical evaluation by panel of health professionals Pilot study conducted on 30 GP, 20 PN and 10 dieticians
						If overweight, sufferers of urinary incontinence should reduce their body weight [Agree = correct]		GP = 97% correct; PN = 86% correct; Dieticians = 86% correct Significance difference between professional groups (p<0.001); no association with demographics	
						There is no relationship between overweight and sleep disturbances [Disagree = correct]		GP = 87% correct; PN = 66% correct; Dieticians = 78% correct Significance difference between professional groups (p<0.001); healthy BMI positively associated with accurate response compare to overweight in PN (p<0.01) & GP (p<0.05)	
						Increasing body weight leads to increasing psychological problems [Agree = correct]		GP = 86% correct; PN = 76% correct; Dieticians = 76% correct Significance difference between professional groups (p<0.001); no association with demographics	

[i]Information from Morris et al. 1999 [14]; [j][...] indicates authors' interpretation of item responses; [k]conclusive evidence not provided

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Hare *et al.* 2000 [15]	-	US	335 exercise professionals	Self-admin, anon	Perception	*Obese persons have more medical problems than non-obese persons*	7-point; strongly agree = 6 or 7 to strongly disagree = 1 or 2	83% = 6 or 7; 2% = 1 or 2	Items modified from Price *et al.* 1987 [16], Price, Desmond & Ruppert 1990 [17], Price *et al.* 1989 [18]
						Obesity is a significant cause of personal rejection		62% = 6 or 7; 2% = 1 or 2	
						How important do you believe normal weight is to the health of a person?	7-point; very important/ not important[k]	71% = 6 or 7; 6% = 1 or 2	Content validity established using a review by 3 experts; revisions subsequently made
									Test-retest reliability coefficient for total unstructured survey = 0.67; n = 23 exercise professionals, tests administered 1wk apart

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Harris 1983 [19]	-	Australia	222 university students	Self-admin, anon	Knowledge	*Being even 10-15 pounds overweight decreases one's life expectancy* [False = correct]	True/false/ uncertain; incorrect = 0, ? = 1, correct = 2	Mean = 0.89	Item included in a 8-item general obesity-related knowledge scale (Cronbach's Alpha = 0.11) 10 references cited to support false = correct
Harris & Koehler 1992 [20]	-	US	318 adults, 14-82 years, 4 groups = (male vs. female) x (Anglo vs. Hispanic)	Self-admin, anon	Attitude	*People who weigh less have lower blood pressure*	5-point; strongly agree = 5 to strongly disagree = 1	% of maximum score = 61 - 69% Anglos scored > Hispanics; no significant gender or gender-by-ethnicity effects	Items incorporated into a 5-item 'Consequences' subscale (Cronbach's Alpha = 0.42) on basis of factor analysis
						It is perfectly O.K. to gain weight as you get older		% of max score = 36 - 40% No significant gender, ethnicity or gender-by-ethnicity effects	
						Nearly all Americans would be healthier if they lost some weight		*% of max score* = 77 - 85% No significant gender, ethnicity or gender-by-ethnicity effects	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Harvey & Hill 2001 [21]	-	UK	204 general practitioners (GP) & 51 clinical psychologists (CP) received 1 of 4 questionnaire, only 2 weight related	Self-admin	Attitude	All items substituted with '*moderately overweight*' or '*extremely overweight*'[1]	6-point; 1 = strongly disagree to 6 = strongly agree; all items positively scored so that higher scores = more positive attitudes towards moderately /extremely overweight people	Mean score (sd):	Developed from Allison, Basile & Yucker 1991 [22]
						{...} people are as happy as normal weight people		Moderate = 3.36 (1.30) Extreme = 2.55 (1.12)	Cronbach's Alpha for 20-item scale = 0.83
						Most {...} people feel that they are not as good as		Moderate = 3.61 (1.26) Extreme = 2.73 (1.12)	In principal components analysis the 3 factors extracted accounting for 54.0% of variance; 'Social Difficulties', 'Self-Esteem', 'Attractiveness / Personal appeal'
						Most {...} people are more self-conscious than other people		Moderate = 3.23 (1.13) Extreme = 2.62 (1.15)	
						{...} workers cannot be as successful as other workers		Moderate = 4.57 (1.34) Extreme = 3.81 (1.58)	
						Most normal weight people would not want to		Moderate = 4.28 (1.25) Extreme = 3.19 (1.39)	
						{...} people are usually untidy		Moderate = 5.25 (1.17) Extreme = 4.98 (1.13)	In 14 of the 20 items 'extremely overweight' was viewed significantly more negatively than 'moderately overweight' (p<0.01); obese rated lowest for health & sexual attractiveness
						{...} people are usually sociable		Moderate = 3.26 (1.24) Extreme = 3.09 (1.25)	
						Most {...} people are not dissatisfied with		Moderate = 3.16 (1.04) Extreme = 2.57 (1.02)	
						{...} people are just as self-confident as other people		Moderate = 3.49 (1.16) Extreme = 2.64 (0.94)	
						Most people feel uncomfortable when they		Moderate = 4.81 (0.97) Extreme = 4.21 (1.28)	
						{...} people are often less aggressive than normal weight people		Moderate = 4.62 (1.14) Extreme = 4.19 (1.15)	

[1]*information obtained through personal communication with authors[23]*

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Harvey & Hill 2001 [21] *continued*						*Most {...} people have different personalities than normal weight people*		Moderate = 4.81 (1.13) Extreme =4.19 (1.23)	
						Very few {...} people are ashamed of their weight		Moderate = 2.72 (1.19) Extreme = 2.34 (1.05)	
						Most {...} people resent normal weight people		Moderate = 4.35 (1.22) Extreme = 4.30 (1.21)	
						{...} people are more emotional than other people		Moderate = 4.71 (1.03) Extreme = 4.70 (1.06)	
						{...} people should not expect to lead normal		Moderate = 5.17 (1.14) Extreme = 4.53 (1.40)	
						{...} people are just as healthy as normal weight people		Moderate = 2.55 (1.24) Extreme = 1.62 (0.92)	
						{...} people are just as sexually attractive as normal weight people		Moderate = 3.29 (1.36) Extreme = 2.09 (0.86)	
						{...} people tend to have family problems		Moderate = 4.52 (1.16) Extreme = 3.85 (1.40)	
						One of the worst things that could happen to a person would be for him/her to become {...}		Moderate = 4.94 (1.27) Extreme = 4.04 (1.55)	
								GP ratings significantly lower than CP on 9 items	
								Mean 20-item summative score (sd): Moderate = 4.04 (0.63) Extreme = 3.41 (0.61)	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Hoppe & Ogden 1997 [24]	-	UK	586 practice nurses	Self-admin	Belief	Rate the benefits of weight loss to health	7-point; not at all = 1 to extremely = 7	Mean = 6.26 – 6.31 No significant main effects for self-report BMI or running a weight loss clinic	-
						In comparison to patients of average weight, what is the likelihood that obese patients will suffer from the following health problems? *...coronary heart disease* *...stroke* *...hypertension*	7-point; much below average = 1 to much above average = 7; sum of 3 items = cardio-vascular con-sequences scale	Mean summative score = 5.84 – 6.04 No significant main effects for self-report BMI or running a weight loss clinic	Cardiovascular consequences of obesity scale Cronbach's Alpha = 0.81
						In comparison to patients of average weight, what is the likelihood that obese patients will suffer from the following health problems? *...diabetes* *...psychological problems* *...joint trauma*	7-point; much below average = 1 to much above average = 7; sum of 4 items (1 not specified) = non-cardio-vascular con-sequences scale	Mean summative score = 5.04 – 5.44 No significant main effects for self-report BMI or running a weight loss clinic	Non-cardiovascular consequences of obesity scale Cronbach's Alpha = 0.71

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Hoppe & Ogden 1997 [24] *continued*						Seriousness of obesity to health	7-point[k]	Mean = 5.92 – 6.08 No significant main effects for self-report BMI or running a weight loss clinic	-
Kan & Tsai 2004 [25]	2000 - 2001	Taiwan	1726 males, 1974 females	-	Knowledge	Do you think obesity will cause: *...apoplexy* *...hypertension* *...diabetes* *...heart disease* *...gout* *...breast cancer* *...ulcer*	4-point; very likely = 3, possibly = 2, don't know = 1, not possible = 0	Male: Mean factor scores (sd) = -4.83E-10 (0.99) Female: Mean factor scores (sd) = -2.67E-09 (2.61) Factor scores in men positively associated with BMI if BMI <0.65 percentile, negatively associated if BMI >0.95 percentile No significant association between scores & BMI in women	In factor analysis conducted separately on male & female samples, only 1 factor produces Eigen Value > 1 on which all items load heavily (>0.9) & exclusively (not >0.3 on any other factor)
Kristeller & Hoerr 1997 [26]	1991	US	1,222 physicians: 222 family practice, 172 internal medicine, 255 endocrinology, 152 cardiology, 216 gynecology, 205 orthopaedics	Self-admin, not anon	Perception	Rank morbid (defined as 100%+ over ideal weight), moderate (40-99% over ideal weight), and mild obesity (20-39% over ideal weight) in comparison to 6 other health risk factors, in importance to the *maintenance of an individual's general health and the avoidance of future medical problems*		Average ranking: smoking = 1.9, morbid obesity = 3.0, excess alcohol = 3.9, moderate obesity = 5.1, high dietary cholesterol = 5.2, lack of exercise = 5.2, high stress = 6.1, high salt intake = 6.9, mild obesity = 7.7 Rankings similar across specialities	Questionnaire based upon Mullen & Tabak 1989 [27], Ockene *et al.* 1984 [28], & information from focus groups Pilot telephone survey conducted; n = 79

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Kristeller & Hoerr 1997 [26] *continued*					Perception	Importance of weight loss for:			
						... type II diabetes	5-point; 5 = most important	Mean = 4.8	
						... hypertension		Mean = 4.4	
						... arthritis in a weight bearing joint		Mean = 4.3	
						... sleep apnea		Mean = 4.3	
						... coronary heart disease		Mean = 4.1	
						... chronic back pain / injuries		Mean = 4.1 Similar ratings across specialit-ies	
						... impending cardiac surgery		Mean = 3.9	
						... impending orthopaedic surgery		Mean = 3.9	
						... impending abdominal surgery		Mean = 3.8	
						... chronic obstructive pulmonary disease		Mean = 3.3	
					Attitude	*I think it is important to treat obesity before it has a chance to cause medically related problems*	7-point; strongly agree = 7 to strongly disagree = 1	Mean score = 5.8	Items incorporated into a 7-item subscale 'Physician Concern' on basis of factor analysis
						Being obese is not a serious problem unless it causes or aggrevates a patient's medical condition		Mean score = 2.5	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Loomis *et al.* 2001 [29]	1998	US	214 military family physicians	Self-admin, not anon	Belief	Role of obesity in the aetiology of:			Items based upon Price *et al.* 1987 [30] For validation, 6 experts reviewed questionnaire; modifications subsequently made
						...coronary disease	7-point[k]	86% believed	
						... osteoarthritis		78% believed	
						... diabetes mellitus		92% believed	
						... hypertension		87% believed	
						... colon cancer		35% correctly identified obesity as risk factor for colorectal cancer	
Marketing and Opinion Research International (MORI) 1999 [31]	1999	UK	2,098 individuals, 15 years+, responses weighted to UK population	Face-to-face interview	Attitude	Obesity is a serious health risk	-	9 in 10 adults agreed 55+ age group and the 25-34 age group most likely to agree strongly	-
						Stigma associated with obesity	-	9 in 10 adults agreed <25 & >54 age group least likely to agree (>8 in 10), 84% in London, 93% in Yorkshire & Humberside	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
McArthur, Pena & Holbert 2001 [32]	-	Latin America	1272 9th grade children, (high vs. low socio-economic status (SES)) x (6 cities)	Self-admin, anon	Knowledge	*Which health problem occurs more frequently among overweight people than among people of normal weight?*[m] *a. Fevers* *b. Intestinal infections* *c. Heart disease* *d. Don't know* *Where on the body is it more dangerous to health to have excess of fat?* *a. The abdomen ("The stomach")* *b. The legs* *c. The hips* *d. Don't know* *Which health problem could improve when an overweight person loses weight?* *a. Iron deficiency* *b. Diabetes (high blood sugar)* *c. Cancer* *d. Don't know* *Which is one of the health benefits when an overweight person loses weight?* *a. The blood sugar increases* *b. The heart works more efficiently* *c. The blood pressure increases* *d. Don't know* *Which health problem is associated with an excess of body fat?* *a. high blood pressure* *b. iron deficiency* *c. intestinal infections* *d. don't know*		Summative score range from -5 to +5 (each correct answer = 1 point, incorrect = -1 point, don't know = 0) Mean score (sd) = 1.0 (1.9) – 2.6 (1.7) The low SES group scored significantly lower than the high SES group when controlled for gender & BMI	Questionnaire based upon James, Rienzo & Frazee 1997 [33], Nicklas *et al.* 1998 [34], Perry-Hunnicuft & Newman 1993 [35] Input from collaborators to ensure culturally sensitive & age-appropriate vocabulary Content validity established using review by 3 experts Pilot tested on ~20 students from each city; items too difficult or too easy subsequently re-written or discarded Reliability coefficient adequate

[m] *information obtained through personal communication with author [36]*

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
McArthur & Ross 1997 [37]	-	US	439 dieticians with experience of counselling overweight clients	Self-admin	Attitudes	*Overweight clients are physically attractive*	Strongly disagree to strongly agree	18.5% = strongly disagree 56.2% = neither agree nor disagree 25.2% = strongly agree	Content validity established by a panel of experts who rated each item on 5-point scale (very unimportant to very important)
						Overweight clients are competent employees		1.2% = strongly disagree 27.6% = neither agree nor disagree 71.2% = strongly agree	Items included in a 37-item 'Attitudes toward overweight clients' scale (Cronbach's Alpha = 0.84)
						Overweight clients are trustworthy		2.2% = strongly disagree 37.9% = neither agree nor disagree 59.9% = strongly agree	
						Overweight clients lack confidence in social situations		46.7% = strongly disagree 45.1% = neither agree nor disagree 38.2% = strongly agree	
Monneuse, Bellisle & Koppet 1997 [38]	1990 - 1991	France	253 university students, non-health related courses	Self-admin, anon	Knowledge	Risk assessment matrix – endorse correct disease/behaviour relationships, included *being overweight* plotted against:			
						...heart disease		Males = 81% endorsed vs. females = 82%; NS[n]	
						...high blood pressure		Males = 53% endorsed vs. females = 65%; NS	
						...diabetes			
						...breast cancer			
						...mental illness		<10% endorsed[k]	
						...skin cancer			
						...lung cancer			

[n]NS = non significant

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Monneuse, Bellisle & Koppet 1997 [38] *continued*					Belief	*In this section, we are interested in how important you feel the following health measures are. Please circle the appropriate number…*			-
						keep bodyweight within normal limits	10-point; of very low importance = 1 to of very great importance = 10	Mean scores (sem): Females = 7.70 (0.16) vs. males = 6.63 (0.25); (F=13.97; p<0.001) Perceived self as underweight = 8.04 & right weight = 7.18 vs. overweight = 5.88 (F=10.1; p<0.001) Significant association between frequency or intensity of carrying out behaviour & the mean rating of the associated belief (p<0.001)	
						lose weight		Mean scores (sem): Females = 4.62 (0.20) vs. males = 3.27 (0.24); (F=17.52; p<0.001) Significant association between frequency or intensity of carrying out behaviour & the mean rating of the associated belief (p<0.001)	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Neumark-Sztainer, Story & Harris 1999 [39]	-	US	115 teachers & school health care providers working with adolescents	Self-admin	Attitudes	*Obese people are as happy as nonobese people*	6pt; 1 = strongly agree to 6 = strongly disagree Recoded to strongly agree = +3 to strongly disagree = -3 to produce item means. Scale score = sum of item means with negative items x -1 + 48; higher scores = more positive attitudes toward obese persons	38.6% = 1 or 2; 32.4% = 5 or 6; Mean (sd) = 0.1 (2.2)	Adapted from Allison, Basile & Yucker 1991 [22] Cronbach's Alpha for 16-item scale = 0.68
						Most obese people feel that they are not as good as other people		57.0% = 1 or 2; 11.4% = 5 or 6; Mean (sd) = 1.1 (1.9)	
						Most obese persons are more self-conscious than other people		65.8% = 1 or 2; 6.2% = 5 or 6; Mean (sd) = 1.5 (1.5)	
						Obese workers cannot be as successful as other workers		17.5% = 1 or 2; 68.5% = 5 or 6; Mean (sd) = -1.4 (2.0)	
						Most nonobese would not want to marry anyone who is obese		46.5% = 1 or 2; 21.9% = 5 or 6; Mean (sd) = 0.5 (2.1)	
						Severely obese people are usually untidy		20.2% = 1 or 2; 67.5% = 5 or 6; Mean (sd) = -1.3 (2.2)	
						Obese persons are just as confident as other people		36.9% = 1 or 2; 29.0% = 5 or 6; Mean (sd) = 0.2 (2.1)	
						Most people feel uncomfortable when they associate with obese people		42.9% = 1 or 2; 36.0% = 5 or 6; Mean (sd) = 0.2 (2.4)	
						Obese people are often less aggressive than non-obese people		33.3% = 1 or 2; 33.3% = 5 or 6; Mean (sd) = -0.2 (2.2)	
						Most obese people have different personalities than nonobese people		20.9% = 1 or 2; 58.2% = 5 or 6; Mean (sd) = -1.0 (2.1)	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Neumark-Sztainer, Story & Harris 1999 [39] *continued*						*Obese people are more emotional than other people*		19.3% = 1 or 2; 60.5% = 5 or 6; Mean (sd) = -1.1 (2.0)	
						Obese people should not expect to lead normal lives		16.5% = 1 or 2; 68.7% = 5 or 6; Mean (sd) = -1.4 (2.1)	
						Obese people are just as healthy as nonobese people		17.4% = 1 or 2; 59.1% = 5 or 6; Mean (sd) = -1.3 (1.9)	
						Obese people are just as sexually attractive as nonobese people		30.4% = 1 or 2; 41.8% = 5 or 6; Mean (sd) = -0.4 (2.2)	
						Obese people tend to have family problems		27.5% = 1 or 2; 41.6% = 5 or 6; Mean (sd) = -0.5 (2.2)	
						One of the worst things that could happen to a person would be for him/her to become obese		27.9% = 1 or 2; 53.9% = 5 or 6; Mean (sd) = -0.7 (2.3)	
								Mean 16-item attitude scale (sd) = 42.4 (13.8); range = 14 - 93	
Ogden 2000 [40]	-	UK	Female slimming club members; 58 stable obese (SO), 40 weight loss regainers (WLRs), 44 weight loss maintainers (WLMs)	Self-admin	Belief	*Subjects rated a series of items to reflect the extent to which they believed that they were consequences of obesity which were summated to produce a total score:*			
						a) medical (joint problems, heart disease, stomach cancer, bowel cancer, diabetes)		SO = 3.14 ± 1.07; WLR = 3.11 ± 1.13; WLM = 3.54 ± 0.95; NS main group effect	Medical subscale Cronbach's Alpha = 0.87
						b) psychological (depression, anxiety, phobias, low self-esteem, lack of confidence)		SO = 3.67 ± 0.88; WLR = 4.07 ± 0.87; WLM = 4.44 ± 0.53; significant main group effect ($p<0.001$)	Psychological subscale Cronbach's Alpha = 0.81

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Ogden *et al.* 2001 [41]	-	UK	89 general practitioners (GP), 599 general practice patients (Pt)	Self-admin	Belief	Consequences of obesity		Mean score (sd):	-
						...diabetes		GP = 3.91 (0.79) vs. Pt = 3.22 (1.11); F=20.08; p<0.001	
						...painful joints		GP = 3.57 (0.87) vs. Pt = 3.34 (1.07); NS	
						...heart disease		GP = 3.73 (0.82) vs. Pt = 3.69 (1.11); NS	
						...high blood pressure		GP = 3.74 (0.85); Pt = 3.75 (1.02); NS	
						...depression/anxiety	5-point; not at all = 1 to totally = 5	GP = 3.28 (0.98) vs. Pt = 3.48 (1.00); NS	
						...not feeling attractive		GP = 3.66 (0.85) vs. Pts = 3.64 (1.17); NS	
						...not feeling good about yourself		GP = 3.44 (0.8) vs. Pts = 3.51 (1.07); NS	
						...difficulty making friends		GP = 2.8 (0.94) vs. Pt = 2.83 (1.16); NS	
						...difficulty getting work		GP = 2.71 (0.91) vs. Pt = 3.16 (1.16); F=11.68; p<0.001	
						...difficulty getting medical/surgical treatment		GP = 2.89 (0.98) vs. Pt = 2.67 (1.19); NS	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Power, Holzman & Schulkin 2001 [42]	2000	US	525 obstetrician - gynecologists	Self-admin	Knowledge	*Please rate each of the following diseases or health concerns by your opinion as to whether obesity: 1 = increases the incidence, 2 = might increase the incidence, 3 = has no effect, 4 = might decrease the incidence, 5 = decreases the incidence, or 6 = you have no opinion°*			-
						...colon cancer		Majority = 1 or 2	
						...diabetes mellitus		Majority = 1	
						...infertility		Majority = 1 or 2	
						...pre-eclampsia		Majority = 1 or 2	
						...breast cancer		Majority = 1 or 2	
						...ovarian cancer		Majority = 3	
						...preterm labor		Majority = 3	
						...cardiovascular disease		Majority = 1	
						...osteoporosis		Majority = 4	
						...hyperinsulemia		Majority = 1	
						...hypercholesteremia		Majority = 1	
						...birth defects		Majority = 3	
						...lung cancer		Majority = 3	
						...depression		Majority = 1 or 2	
						...menstrual irregularities		Majority = 1	
						...intrauterine growth retardation		Majority = 3	
						...premenstrual syndrome		Majority = 3	
						...endometriosis		Majority = 3	

°information obtained through personal communication with authors[43]

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Power, Holzman & Schulkin 2001 [42] *continued*					-	*To what extent do you feel the following are possible risk factors for hypertension? ... obesity*[a]	4-point; major risk factor = 1, minor risk factor = 2, not a risk factor = 3, don't know = 4	89.0% = major; 8.6% minor risk factor	
						To what extent do you feel the following are possible risk factors for gestational diabetes? ... obesity[a]		72.6% = major risk factor	
					Attitude	*Obesity is a major health problem in the United States*	5-point; strongly agree = 1 to strongly disagree = 5	93.4% = 1 or 2; 3.8% = 4 or 5	
						Outside of pregnancy, the benefits of weight loss for obese patients are greater than the risks		87.4% = 1 or 2; 7.4% = 4 or 5	
						Obesity is a major concern for my nonpregnant patients		85.0% = 1 or 2; 3.2% = 4 or 5	
						During pregnancy, the benefits of weight loss for obese patients are greater than the risks		21.1% = 1 or 2; 51.8% = 4 or 5	
						Weight reduction efforts generally do not improve health		6.3% = 1 or 2; 86.1% = 4 or 5	
						The health risks of obesity are overstated		4.3% = 1 or 2; 85.9% = 4 or 5	
						The health risks of obesity are unproven		1.7% = 1 or 2; 91.7% = 4 or 5	
						Obesity should not be treated		1.0% = 1 or 2; 92.6% = 4 or 5	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Power, Holzman & Schulkin 2001 [42] *continued*					Opinion	*How important to the health of your patients do you consider weight to be?*	4-point; very important, important, not important,	49.1% = very important	
					Opinion	Importance of weight to the health of:			
						... pregnant patients		54.3% = very important	
						... hypertensive patients		75.8% = very important	
						... diabetic patients		83.8% = very important	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Price *et al.* 1985 [44]	-	US	187 general education college students (40 – 54 completed each of the 4 response formats)	Self-admin	Knowledge	*People who are slightly overweight tend to live shorter lives* [False = correct]	True/False (T/F) or True/False/ Uncertain (T/F/U) or 5-point Likert Scale (5-pt) or Multiple Choice (MC; 1 correct answer, 3 foils)	T/F = 47.2% correct T/F/U = 30.0% correct 5-pt = 33.3% correct MC = 38.5% correct	Test validity established 5 research studies confirmed designated correct item response & at least 3 out of the 4 authorities consulted also agreed Items incorporated into a 12-item general obesity knowledge scale (Kuder-Richardson 20 coefficient: T/F = 0.28, T/F/U = 0.29, 5-pt = 0.4, MC = 0.12; Test-retest reliability coefficient: T/F = 0.75, T/F/U = 0.74, 5-pt = 0.62, MC = 0.61; % of discriminating items: T/F = 66.7%, T/F/U = 58.3%, 5-pt = 41.7%, MC = 83.3%; SMOG readability test: T/F = 9th grade, T/F/U = 9th grade, 5-pt = 12th grade, MC = 12th grade)
						Obese people are at greater risk of developing heart disease [True = correct]		T/F = 98.1% correct T/F/U = 97.5% correct 5-pt = 81.1% correct MC = 95.0% correct	
						Obese people are at greater risk of developing some forms of cancer [True = correct]		T/F = 52.9% correct T/F/U = 27.5% correct 5-pt = 5.66% correct MC = 80.0% correct	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Price *et al.* 1987 [30]	-	US	318 family physicians	Self-admin, anon	Beliefs	Role of obesity in the aetiology of:			Questionnaire based upon previous literature Reviewed by 3 physicians; minor modifications subsequently made
						... *coronary disease*	7-point[k]	88% believed, lower self-report BMI more likely to believe (p<0.01)	
						... *osteoarthritis*	7-point[k]	85% believed, those in practice ≤5years more likely to believe (p=0.01)	
						... *diabetes mellitus*	7-point[k]	96% believed, female more likely to believe (p<0.01), lower self-report BMI more likely to believe (p<0.01), those in practice ≤5years more likely to believe (p=0.01)	
						... *stress*	7-point[k]	60% believed, female more likely to believe (p<0.01), lower self-report BMI more likely to believe (p<0.01)	
						... *colon cancer*	7-point[k]	48% believed, lower self-report BMI more likely to believe (p<0.01)	
						94% believed normal weight is important for patients			
						52% believed increased health risks did not occur until patients were 20% above ideal weight			

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Price *et al.* 1987 [16]	1986 - 1987	US	220 school nurses	Self-admin, anon	Beliefs	*What role does obesity play in the etiology of the following diseases?*			Questionnaire based upon previous literature
						... coronary disease	7-point[k]	89% = agree or strongly agree	Cronbach's Alpha of 50-item unstructured survey = 0.80
						... osteoarthritis		48% = agree or strongly agree	
						... diabetes mellitus type II		71% = agree or strongly agree	
						... hypertension		90% = agree or strongly agree	
						... colon cancer		40% = agree or strongly agree	
						... stress		63% = agree or strongly agree	
						... stroke		73% = agree or strongly agree	
Price *et al.* 1989 [18]	-	US	324 paediatricians	Self-admin, anon	Beliefs	Major role of obesity in the aetiology of:			Questionnaire based on literature & Price *et al.* 1987 [30]
						... coronary disease	7-point; strongly disagree = 1 to strongly agree = 7[k]	73% = 6 or 7	Reviewed by 4 experts; minor modifications subsequently made
						... osteoarthritis		33% = 6 or 7	
						... diabetes mellitus type II		70% = 6 or 7	
						... stress		33% = 6 or 7	
						... colon cancer		12% = 6 or 7	Cronbach's Alpha of 42-item unstructured survey = 0.79
						... stroke		50% = 6 or 7	

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Stern *et al.* 1982 [45]	-	US	849 adults, 25-64 years, 6 groups – (transitional neighbour-hood vs. suburbs) x (Mexican American (MA) vs. Anglo) x (male vs. female)	Face-to-face interview	Knowledge	*People who weigh less have lower blood pressure*	5-point; strongly agree = 5, agree = 4, unsure = 3, disagree = 2, strongly disagree = 1	Age- & weight-adjusted mean (% of max score) = 60-69% In transition neighbourhoods, Anglo women scored significantly higher than MA women ($p<0.05$)	Pre-tested for face & content validity prior to field work
						It is perfectly O.K. to gain weight as you get older		Age- & weight-adjusted mean = 40 – 48% In MA men from transition neighbourhoods scored significantly higher than other groups ($p<0.05$)	
						Nearly all Americans would be healthier if they lost some weight		Age- & weight-adjusted mean = 74 – 78% In suburbs, MA women scored significantly higher than Anglo women ($p<0.05$)	
Story *et al.* 2002 [46]	-	US	441 registered dieticians, 293 paediatric nurse practitioners (PNP), 201 paediatricians	Self-admin or tele-phone interview[p]	Attitude	*Overweight affects chronic disease risk*	5-point; Most of the Time, Often, Sometimes, Rarely, Never	% agreed with the statement either most of the time or often: PNP = 89.3%, paediatricians = 87.4%, dieticians = 76.4%; significant difference between all groups ($p\leq0.05$)	Questionnaire developed from literature, discussions with paediatricians & obesity experts

[p]Information from Trowbridge et al. 2002 [47].

Author(s)	Date	Country	Participants	Format	Cognition	Item	Response Format	Results	Psychometrics
Thompson & Thomas 2000 [48]	-	UK	161 dietetic patients, BMI ≥ 30kg/m^2	Self-admin, anon	Attitude	*Weight is blamed for most medical problems*	5-point; strongly agree to strongly disagree & don't know	84% = agree No significant difference for gender, number of weight loss attempts, age, BMI or reported medical conditions	Questionnaire developed from focus groups involving 15 obese men & women Piloted in a sample of 20 patients; minor alterations subsequently made
						Chairs are never big enough		35% = agree ≥40kg/m^2 more likely to agree than <40kg/m^2 (odds ratio = 4.4 (1.98-9.8)); no significant difference for gender, number of weight loss attempts, age, or reported medical conditions	

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APPENDIX THREE

Please quote ref no: **B/3/2002**

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Louise.Sabir@nottingham.ac.uk

Faculty of Medicine and Health Sciences

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Dr Chris Glazebrook
Senior Lecturer
Behavioural Sciences
Floor A, South Block
Queen's Medical Centre
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NG7 2UH

27 March 2002

Dear Dr Glazebrook

B/3/2002 - Development and validation of a obseity knowledge questionnaire (OKQ)

The above application was considered at the Medical School Research Ethics Committee at its meeting on 14th March 2002 and was approved.

The Committee did however make the following observations which you might find helpful:

1. It was felt that Health Care Professionals may not necessarily be as knowledgeably as you might think on this subject. It may be better if you choose those who work in the area of nutrition in order to get more valid contrast group.

2. The Committee queried whether the system of deleting 20 items from your initial questionnaire is appropriate. Surely whether an item is deleted should depend on how it performs and this may require deleting more or less than 20

Approval is given on the understanding that the Conditions of Approval set out below are followed.

Conditions of Approval

You must follow the protocol agreed and any changes to the protocol will require prior Ethic's Committee approval.

The Committee would expect to see a copy of the final questionnaire before it is used.

Please note that all correspondence and queries should be sent to my Ethics Committee Secretary Louise Sabir

You promptly inform the Chairman of the Ethic's Committee of

(i) deviations from or changes to the protocol which are made to eliminate immediate hazards to the research subjects.

(ii) Any changes that increase the risk to subjects and/or affect significantly the conduct of the research.

(iii) All adverse drug reactions that are both serious and unexpected

(iv) New information that may affect adversely the safety of the subjects or the conduct of the study.

ICH GCP Compliance

The University of Nottingham Medical Research Ethics Committee is fully compliant with "the International Committee on Harmonisation/Good Clinical Practice (ICH/GCP) Guidelines for the Conduct of Trials involving the Participation of Human Subjects" as they relate to the responsibilities, composition, function, operations and records of an Independent Ethics Committee/Independent Review Board. To this end, it undertakes to adhere as far as is consistent with its Constitution, to the relevant clauses of the ICH Harmonised Tripartite Guideline for Good Clinical Practice adopted by the Commission of the European Union on 17 January 1997.

Yours sincerely

RCSpiller

Professor R C Spiller
Chairman, Nottingham University Medical School Ethics Committee

Please note that all correspondence and queries should be sent to my Ethics Committee Secretary Louise Sabir

Please quote protocol ref no **A/4/2003**

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02 June 2003

Ms Judy Swift
PhD Research Student
Behavioural Sciences
Division of Psychiatry
A Floor, South Block
QMC

Dear Ms Swift

A/4/2003 - Obesity and Health: A study of perceptions concerning the consequences of being above ideal weight

Thank you for your letter dated 22nd May in which you clarify the issues raised by the Committee. These have been reviewed and are satisfactory and the study is approved.

Approval is given on the understanding that the Conditions of Approval set out below are followed.

Conditions of Approval

You must follow the protocol agreed and any changes to the protocol will require prior Ethic's Committee approval.

You promptly inform the Chairman of the Ethic's Committee of

(i) deviations from or changes to the protocol which are made to eliminate immediate hazards to the research subjects.

(ii) Any changes that increase the risk to subjects and/or affect significantly the conduct of the research.

(iii) All adverse drug reactions that are both serious and unexpected.

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(iv) New information that may affect adversely the safety of the subjects or the conduct of the study.

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Yours sincerely

R C Spiller

Professor R C Spiller
Chairman, Nottingham University Medical School Ethics Committee

Please note that all correspondence and queries should be sent to my Ethics Committee Secretary Louise Sabir

Please quote ref no: **J/7/2002**

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Dr Cris Glazebrook
Senior Lecturer
Behavioural Sciences
Floor A, South Block
Queen's Medical Centre
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24 July 2002

Dear Dr Glazebrook

J/7/2002 - Obesity and Health: A study of perceptions concerning the consequences of being above ideal weight.

The above application was considered at the Medical School Research Ethics Committee at its meeting on 18th July 2002 and was approved.

Approval is given on the understanding that the Conditions of Approval set out below are followed.

Conditions of Approval

You must follow the protocol agreed and any changes to the protocol will require prior Ethic's Committee approval.

Where applicable the Committee would expect to see a copy of the final questionnaire before it is used.

You promptly inform the Chairman of the Ethic's Committee of

(i) deviations from or changes to the protocol which are made to eliminate immediate hazards to the research subjects.
(ii) Any changes that increase the risk to subjects and/or affect significantly the conduct of the research
(iii) All adverse drug reactions that are both serious and unexpected

Please note that all correspondence and queries should be sent to my Ethics Committee Secretary Louise Sabir

(iv) New information that may affect adversely the safety of the subjects or the conduct of the study.

ICH GCP Compliance

The University of Nottingham Medical Research Ethics Committee is fully compliant with "the International Committee on Harmonisation/Good Clinical Practice (ICH/GCP) Guidelines for the Conduct of Trials involving the Participation of Human Subjects" as they relate to the responsibilities, composition, function, operations and records of an Independent Ethics Committee/Independent Review Board. To this end, it undertakes to adhere as far as is consistent with its Constitution, to the relevant clauses of the ICH Harmonised Tripartite Guideline for Good Clinical Practice adopted by the Commission of the European Union on 17 January 1997.

Yours sincerely

Professor R C Spiller
Chairman, Nottingham University Medical School Ethics Committee

Please note that all correspondence and queries should be sent to my Ethics Committee Secretary Louise Sabir

Queen's Medical Centre Nottingham NHS

University Hospital NHS Trust

Please ask for:
Linda Ellis, Administrative Assistant
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Tel: 0115 970 9049
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Our Reference: GM070203

20th September 2002

Dr C Glazebrook
Behavioural Sciences
A Floor
South Block
UHN

Dear Dr Glazebrook

Re: <u>Obesity And Health: A Study Of Perceptions Concerning The Consequences Of Being Above Ideal Weight</u>

The Ethics Committee met on 2nd September 2002 and approved the project subject to your providing of some information, or clarification. We are now in receipt of this, and the project is now fully approved, including the protocol, parents information sheet, healthy volunteers, invitation, weight chart, focus group, discussion guide, perceptions letters.and consent form.

The Ethics Committee requires that:

i) Serious adverse reaction/events, which occur during the course of the project, are reported to the Committee.

ii) Changes in the protocol are submitted as project amendments to the Committee.

iii) Yearly reports and a final report on the project to be submitted. (Forms will be sent to Lead Investigator for completion).

Kind regards

Yours sincerely

Dr M Hewitt
Honorary Secretary
<u>Ethics Committee</u>

The University of Nottingham

Please quote protocol ref no: **M/9/2003**

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05 November 2003

Ms Judy Swift
PhD Research Student
Division of Psychiatry
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A Floor, South Block
QMC

Dear Ms Swift

M/9/2003 – Perceptions of Obesity as a Health Risk: the development of a short, reliable attitude scale.

Thank you for your letter dated 22nd October 2003 and enclosing revised version of:

- Application form dated 22/10/2003

This has been reviewed and is satisfactory and the concerns raised by the Committee have been addressed. This study is approved. Approval is given on the understanding that the Conditions of Approval set out below are followed.

Conditions of Approval

You must follow the protocol agreed and any changes to the protocol will require prior Ethic's Committee approval.

You promptly inform the Chairman of the Ethic's Committee of

(i) deviations from or changes to the protocol which are made to eliminate immediate hazards to the research subjects.

(ii) Any changes that increase the risk to subjects and/or affect significantly the conduct of the research.

(iii) All adverse drug reactions that are both serious and unexpected.New information that may affect adversely the safety of the subjects or the conduct of the study.

ICH GCP Compliance

The University of Nottingham Medical Research Ethics Committee is fully compliant with "the International Committee on Harmonisation/Good Clinical Practice

Please note that all correspondence and queries should be sent to my Ethics Committee Secretary Louise Sabir

(ICH/GCP) Guidelines for the Conduct of Trials involving the Participation of Human Subjects" as they relate to the responsibilities, composition, function, operations and records of an Independent Ethics Committee/Independent Review Board. To this end, it undertakes to adhere as far as is consistent with its Constitution, to the relevant clauses of the ICH Harmonised Tripartite Guideline for Good Clinical Practice adopted by the Commission of the European Union on 17 January 1997.

Yours sincerely

Professor R C Spiller
Chairman, Nottingham University Medical School Research Ethics Committee

PS You state 200 in your application not 250.

Please note that all correspondence and queries should be sent to my Ethics Committee Secretary Louise Sabir

Amended

Nottingham Research Ethics
Committee 2
1 Standard Court
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NG1 6GN

24 August 2004

Dr Cris Glazebrook
Reader in Health Psychology
Department of Behavioural Sciences,
Division of Psychiatry
Behavioural Sciences, Floor A South Block
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Nottingham
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Dear Dr Glazebrook,

Full title of study: Cognitive, sociodemographic, health and behavioural factors predicting weight loss intentions and behavioural outcomes in patients attending obesity and diabetic clinics
REC reference number: 04/Q2404/61
Protocol number: 4

Thank you for your letter of 10 August 2004, responding to the Committee's request for further information on the above research.

The further information has been considered on behalf of the Committee by the Chairman.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation.

The favourable opinion applies to the following research site:

Site: Queens Medical Centre
Principal Investigator: Dr Cris Glazebrook

Conditions of approval

The favourable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully.

Amended
Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document Type: Application
Version:
Dated: 05/07/2004
Date Received: 09/07/2004

Document Type: Investigator CV
Version:
Dated: 09/07/2004
Date Received: 09/07/2004

Document Type: Protocol
Version: 4
Dated: 10/08/2004
Date Received: 12/08/2004

Document Type: Summary/Synopsis
Version: 3
Dated: 10/08/2004
Date Received: 12/08/2004

Document Type: Statistician Comments
Version:
Dated: 16/06/2004
Date Received: 09/07/2004

Document Type: Copy of Questionnaire Obesity Knowledge
Version: 3
Dated: 10/08/2004
Date Received: 12/08/2004

Document Type: Copy of Questionnaire Obesity Beliefs Scale
Version: 3
Dated: 10/08/2004
Date Received: 12/08/2004

Document Type: Copy of Questionnaire Weight Locus of Control Scale
Version: 2
Dated: 10/08/2004
Date Received: 12/08/2004

Document Type: Copy of Questionnaire Health As A Value Scale
Version: 2
Dated: 10/08/2004
Date Received: 12/08/2004

Document Type: Copy of Questionnaire 12 Health Survey
Version: 3
Dated: 10/08/2004
Date Received: 12/08/2004

Amended

Document Type: Letters of Invitation to Participants Phase Two
Version: 2
Dated: 10/08/2004
Date Received: 12/08/2004

Document Type: Participant Information Sheet Phase Two
Version: 4
Dated: 10/08/2004
Date Received: 12/08/2004

Document Type: Participant Information Sheet Phase One
Version: 4.0
Dated: 10/08/2004
Date Received: 12/08/2004

Document Type: Participant Consent Form
Version: 1.0
Dated: 07/06/2004
Date Received: 09/07/2004

Document Type: GP / Consultant Information Sheet
Version 1
Dated: 10/08/2004
Date Received: 12/08/2004

Management approval

The study may not commence until final management approval has been confirmed by the organisation hosting the research.

All researchers and research collaborators who will be participating in the research must obtain management approval from the relevant host organisation before commencing any research procedures. Where a substantive contract is not held with the host organisation, it may be necessary for an honorary contract to be issued before approval for the research can be given.

Notification of other bodies

We shall notify the research sponsor, Queens Medical Centre and the Medicines and Health-Care Products Regulatory Agency that the study has a favourable ethical opinion.

Amended

Statement of compliance *(from 1 May 2004)*

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

REC reference number: 04/Q2404/61 Please quote this number on all correspondence

Yours sincerely,

Dr M Hewitt / Mrs L Ellis
Chairman / Administrator

Enclosures *List of names and professions of members who were present at the meeting and those who submitted written comments*

Queen's Medical Centre Nottingham
University Hospital NHS Trust

Please reply to:

Research and Development
E11 Curie Court
Queen's Medical Centre
University Hospital
Derby Road
Nottingham
NG7 2UH

Telephone: 0115 9709049
Fax: 0115 8493295
E-mail: deborah.cocks@mail.qmcuh-tr.trent.nhs.uk

22 September 2004

Dr C Glazebrook,
Department of Behavioural Sciences
Division of Psychiatry
A Floor South Block
Queens Medical Centre
Nottingham
NG7 2UH

Dear Dr Glazebrook,

ID: PY060401 **Cognitive, sociodemographic, health and behavioural factors predicting weight loss intentions and behavioural outcomes in patients attending obesity and diabetic clinics**

The R&D Department have considered the following documents:

- R&D Application form, version 02 dated January 2004
- NHS REC Application Form version 3.0 dated January 2004
- Protocol version 3 dated 10th August 2004
- Phase 1 Patient Information Sheet version 4.0 dated 10th August 2004
- Phase 2 Patient Information Sheet version 4.0 dated 10th August 2004
- Consent Form version 1.0 dated 7th June 2004
- GP Letter version 1.0 dated 10th August 2004
- Phase 1 Invitation Letter version 2.0 dated 10th August 2004
- Phase 2 Invitation Letter version 2.0 dated 10th August 2004
- The Obesity Knowledge Questionnaire version 3 dated 10th August 2004
- The Obesity Beliefs Scale version 3 dated 10th August 2004
- Weight Locus of Control Scale version 2 dated 10th August 2004
- The Health as a value Scale version 2 dated 10th August 2004
- Short Form - 12 Health Survey version 3 dated 10th August 2004
- Procedures Flowchart version 3 dated 10th August 2004

Your study now has R&D approval, on the understanding and provision that you will follow the conditions set out below.

Conditions of Approval

That you:

1. Accept the responsibility of Chief/Principal Investigator as defined in the current Research Governance Framework.
2. Request written approval from the R&D department for any change to the approved protocol/study documents you wish to implement
3. Ensure all study personnel, not employed by the Queens Medical Centre, University Hospital NHS Trust Nottingham or the City Hospital NHS Trust Nottingham, hold honorary Contracts with this Trust, before they have access to any facilities, patients, staff, their data, tissue or organs.
4. Report any Serious Adverse Event involving the Trust to the R&D department, using the Trust 'policy for research safety reporting in human subjects'. Policy available from the R&D Department.

5. Complete the R&D Research Governance interim and final reports as requested.
6. Comply with the regulatory requirements and legislation relating to: Data Protection, Trust Caldicott Guidelines, Health and Safety and the use of Human Tissue for research purposes.
7. Comply with the current Research Governance Framework, available at www.doh.gov.uk or via the R&D office or Research Governance Web-site.
8. Agree to conduct this research project in accordance with ICH Good Clinical Practice and/or the MRC Guidelines for Good Clinical Practice (as appropriate)
9. Must not start your project until you have received written approval from the relevant ethics committee.

Please note that the R&D department has a database containing study related information, and personal information about individual investigators e.g. name, address, contact details etc. This information will be managed according to the principles established in the Data Protection Act.

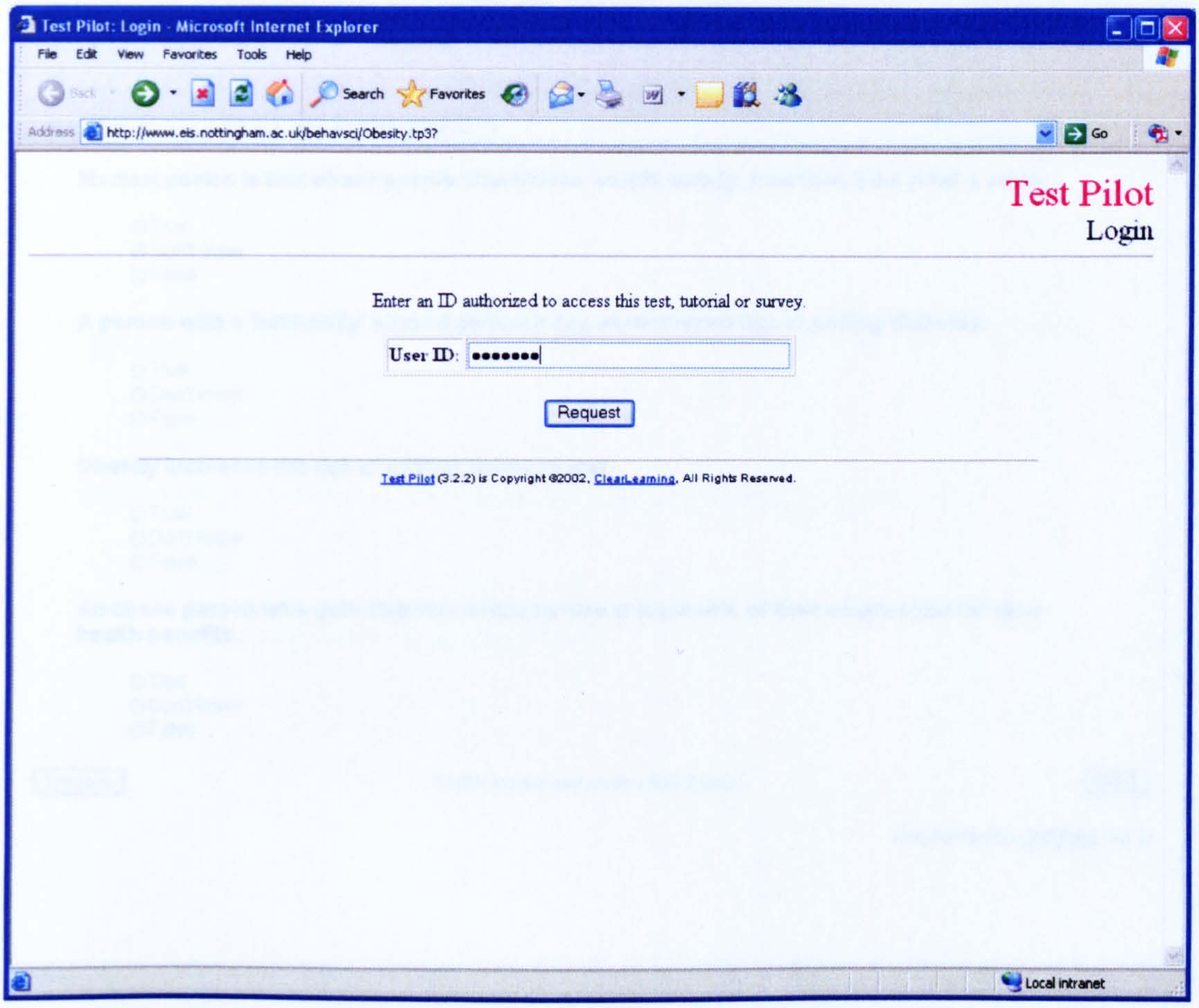
Yours sincerely

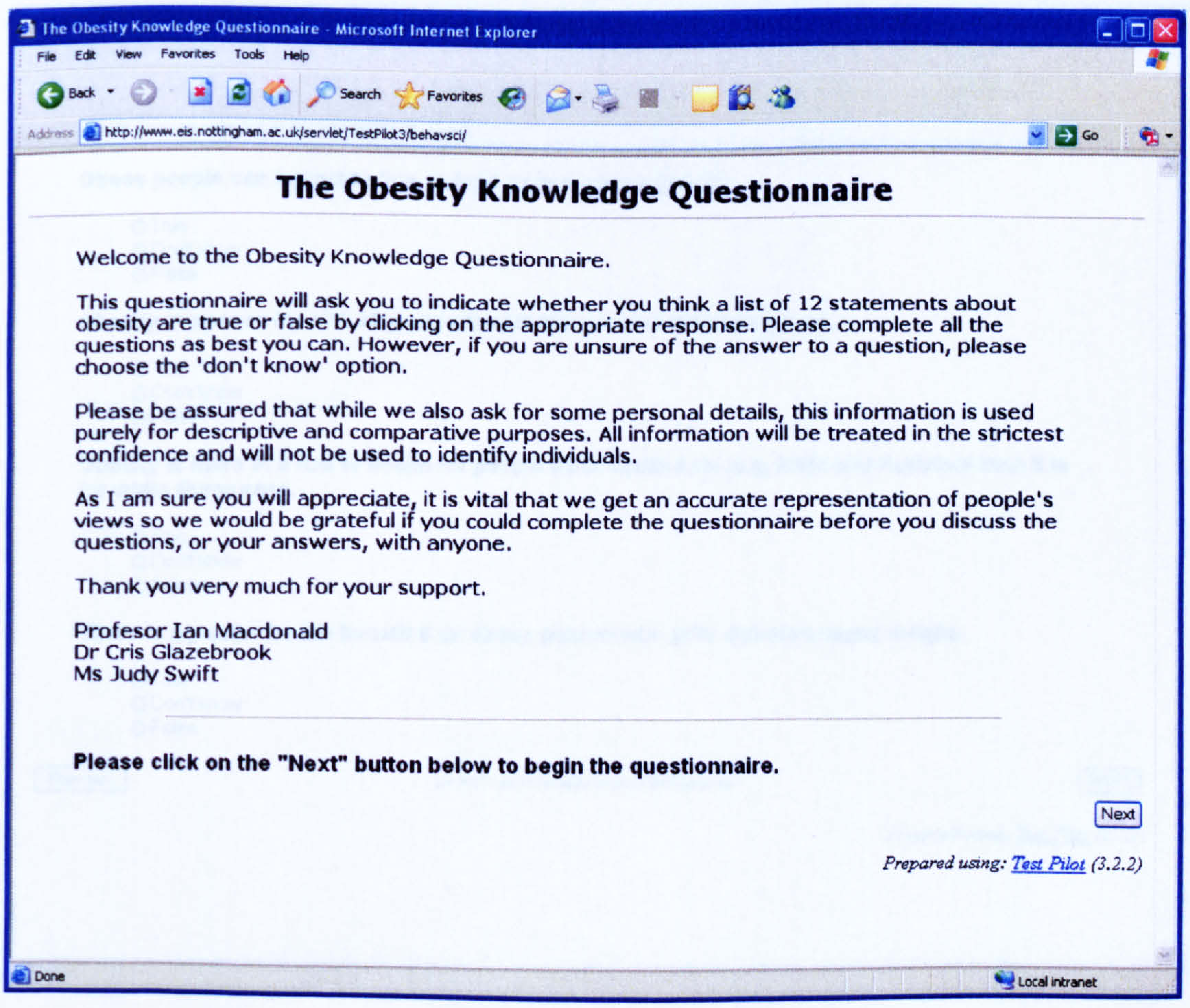
Professor Ian Hall

Research and Development Director

cc Nottingham Research Ethics Committee

APPENDIX FOUR


Test Pilot: Login - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.eis.nottingham.ac.uk/behavsci/Obesity.tp3?
Go
Test Pilot
Login
Enter an ID authorized to access this test, tutorial or survey.
User ID:
Request
Test Pilot (3.2.2) is Copyright ©2002, ClearLearning, All Rights Reserved.
Local intranet


The Obesity Knowledge Questionnaire - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.eis.nottingham.ac.uk/servlet/TestPilot3/behavsci/
Go
The Obesity Knowledge Questionnaire
Welcome to the Obesity Knowledge Questionnaire.
This questionnaire will ask you to indicate whether you think a list of 12 statements about obesity are true or false by clicking on the appropriate response. Please complete all the questions as best you can. However, if you are unsure of the answer to a question, please choose the 'don't know' option.
Please be assured that while we also ask for some personal details, this information is used purely for descriptive and comparative purposes. All information will be treated in the strictest confidence and will not be used to identify individuals.
As I am sure you will appreciate, it is vital that we get an accurate representation of people's views so we would be grateful if you could complete the questionnaire before you discuss the questions, or your answers, with anyone.
Thank you very much for your support.
Profesor Ian Macdonald
Dr Cris Glazebrook
Ms Judy Swift
Please click on the "Next" button below to begin the questionnaire.
Next
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Done
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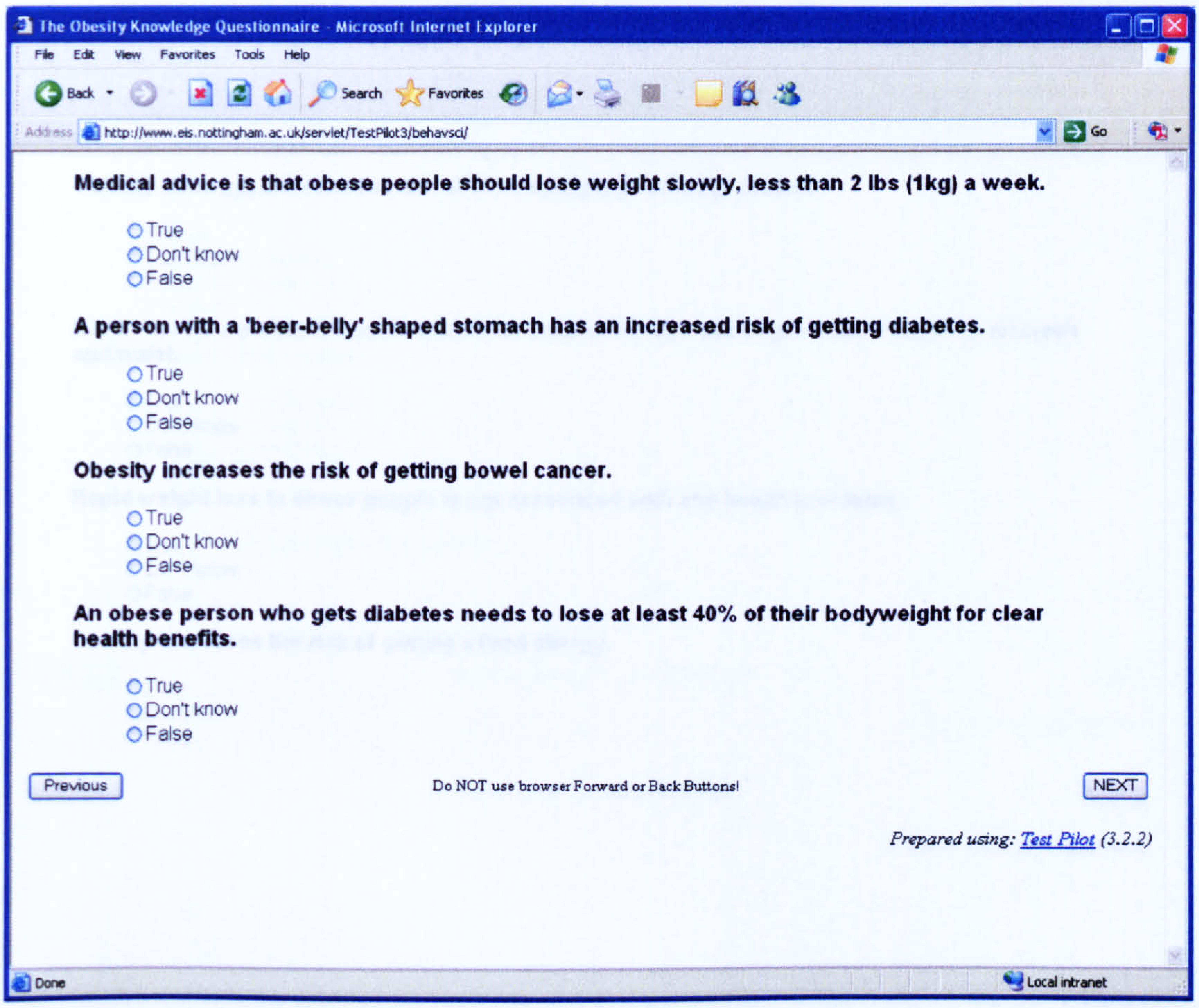
The Obesity Knowledge Questionnaire - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://www.eis.nottingham.ac.uk/servlet/TestPilot3/behavsci/

Medical advice is that obese people should lose weight slowly, less than 2 lbs (1kg) a week.

- True
- Don't know
- False

A person with a 'beer-belly' shaped stomach has an increased risk of getting diabetes.

- True
- Don't know
- False

Obesity increases the risk of getting bowel cancer.

- True
- Don't know
- False

An obese person who gets diabetes needs to lose at least 40% of their bodyweight for clear health benefits.

- True
- Don't know
- False

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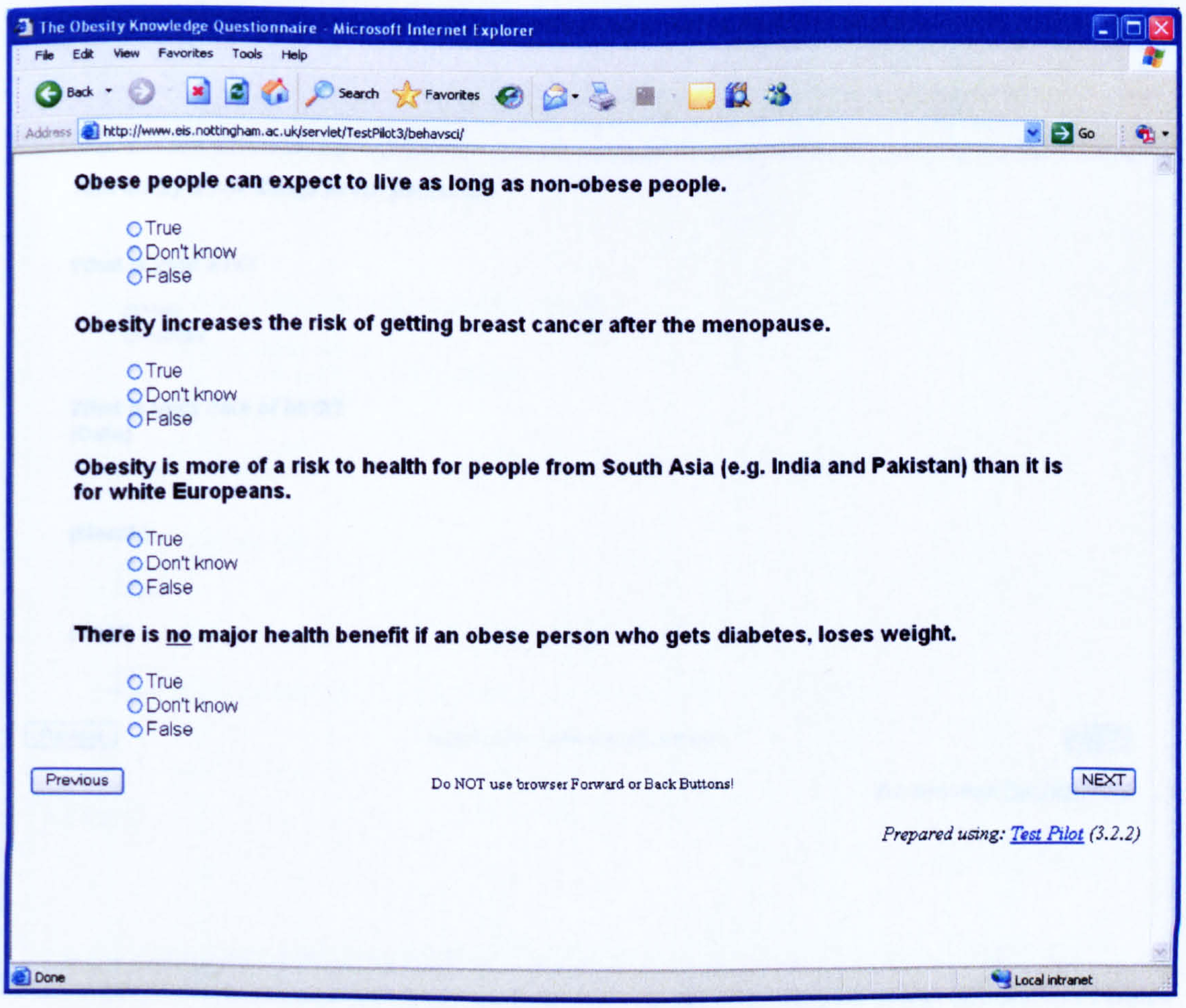
The Obesity Knowledge Questionnaire - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://www.eis.nottingham.ac.uk/servlet/TestPilot3/behavsci/

Obese people can expect to live as long as non-obese people.

- True
- Don't know
- False

Obesity increases the risk of getting breast cancer after the menopause.

- True
- Don't know
- False

Obesity is more of a risk to health for people from South Asia (e.g. India and Pakistan) than it is for white Europeans.

- True
- Don't know
- False

There is <u>no</u> major health benefit if an obese person who gets diabetes, loses weight.

- True
- Don't know
- False

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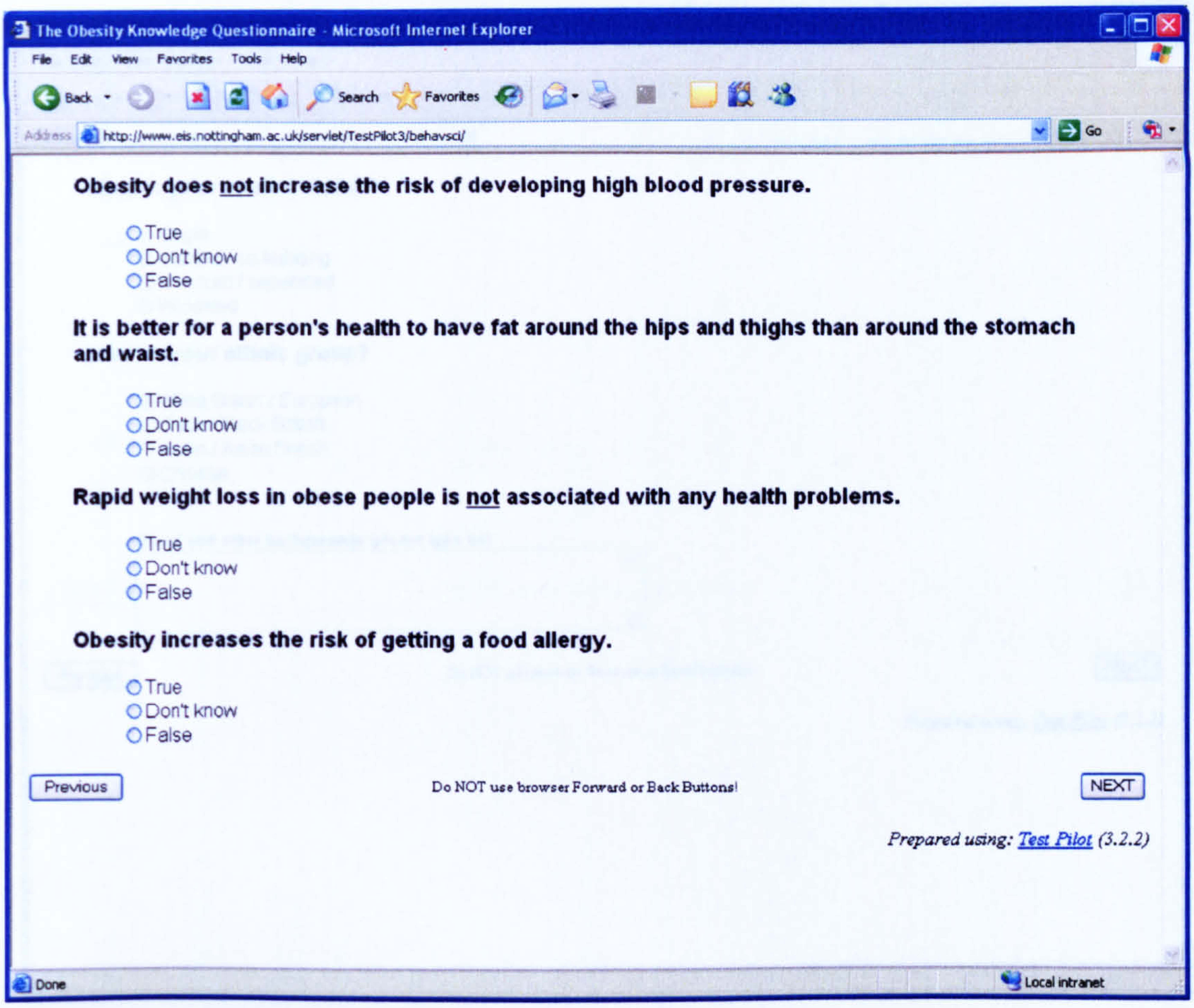

Obesity does not increase the risk of developing high blood pressure.

- True
- Don't know
- False

It is better for a person's health to have fat around the hips and thighs than around the stomach and waist.

- True
- Don't know
- False

Rapid weight loss in obese people is not associated with any health problems.

- True
- Don't know
- False

Obesity increases the risk of getting a food allergy.

- True
- Don't know
- False

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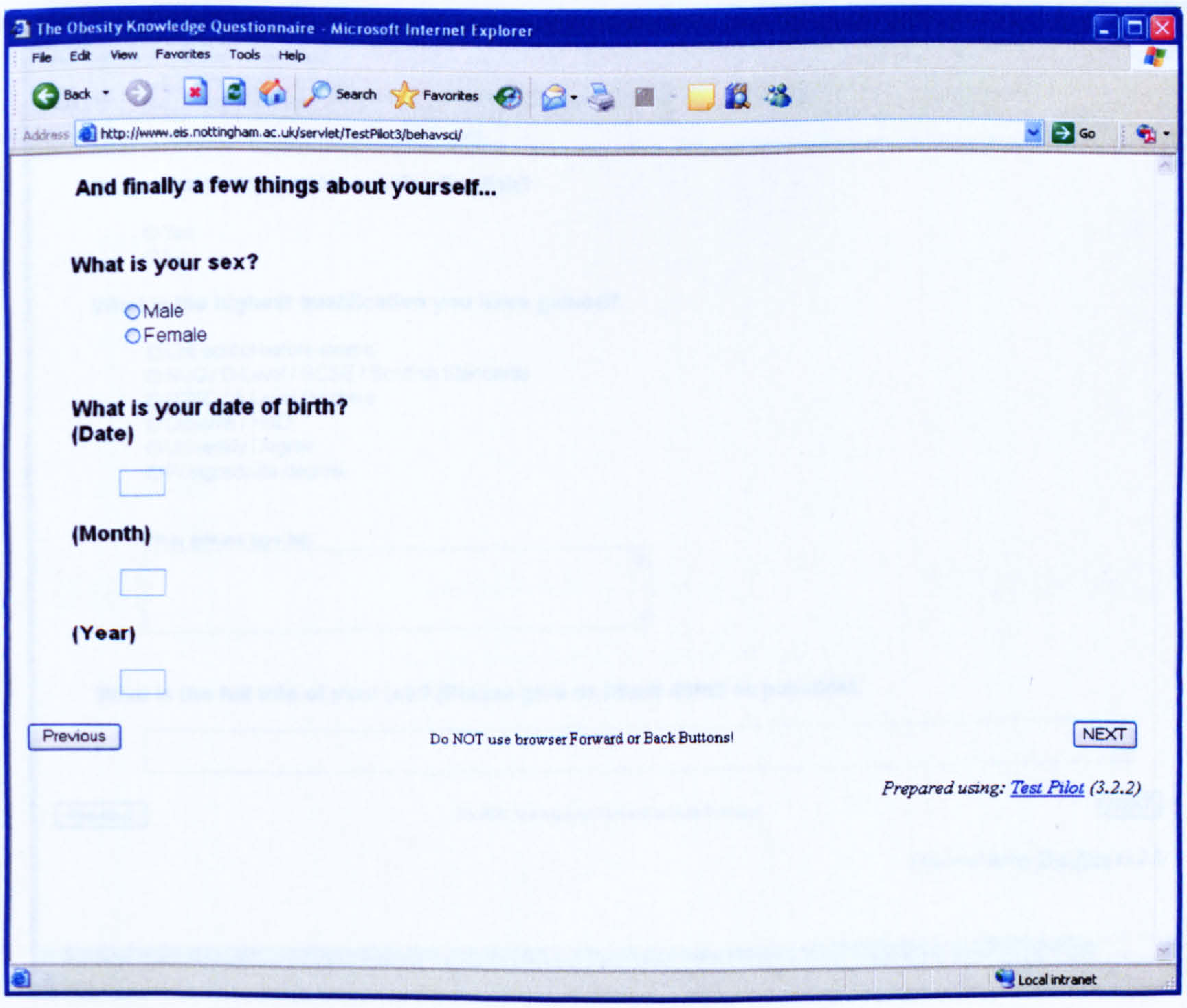

And finally a few things about yourself...

What is your sex?

- Male
- Female

What is your date of birth?
(Date)

(Month)

(Year)

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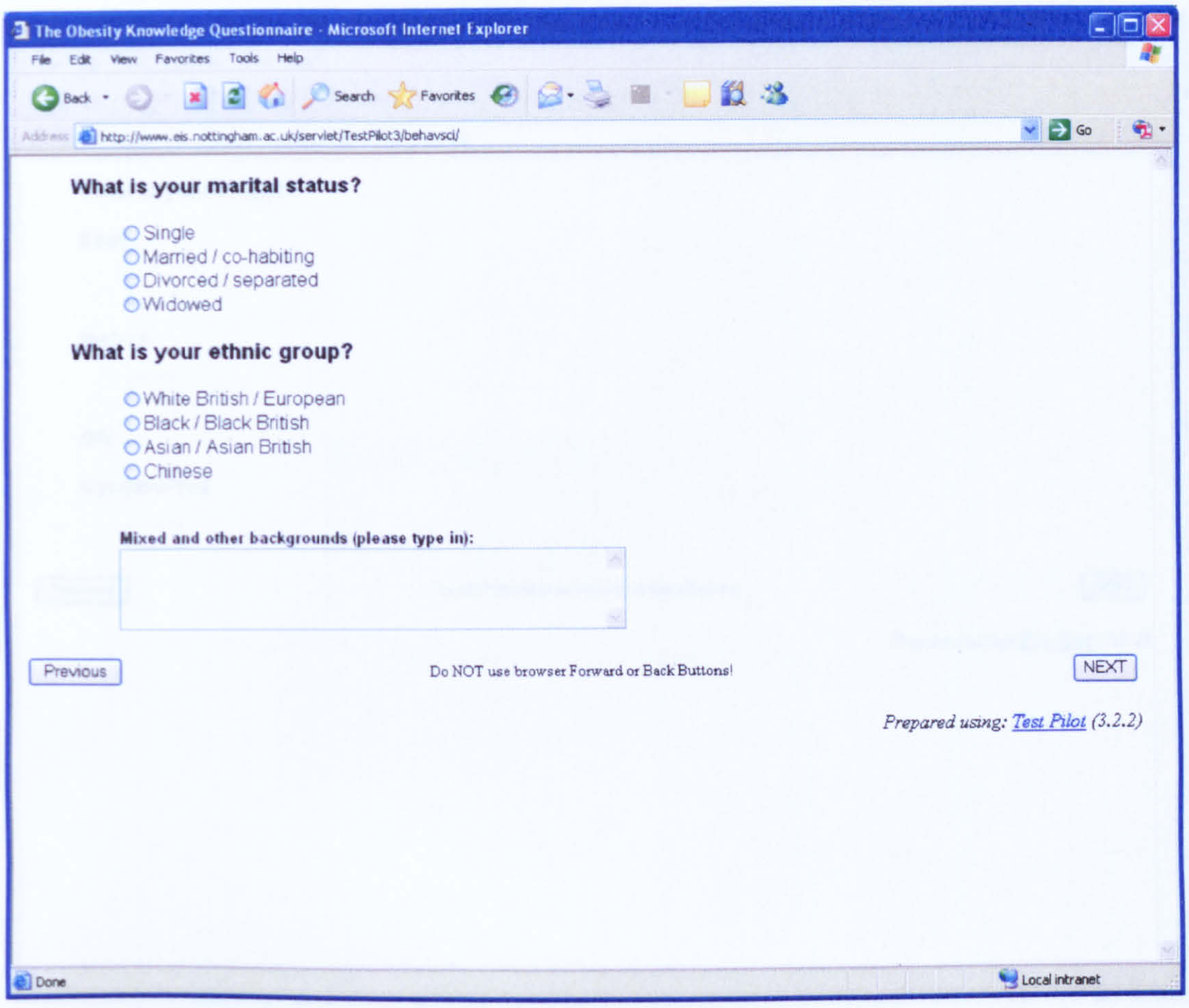

The Obesity Knowledge Questionnaire - Microsoft Internet Explorer

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Address http://www.eis.nottingham.ac.uk/servlet/TestPilot3/behavsci/

What is your marital status?

- Single
- Married / co-habiting
- Divorced / separated
- Widowed

What is your ethnic group?

- White British / European
- Black / Black British
- Asian / Asian British
- Chinese

Mixed and other backgrounds (please type in):

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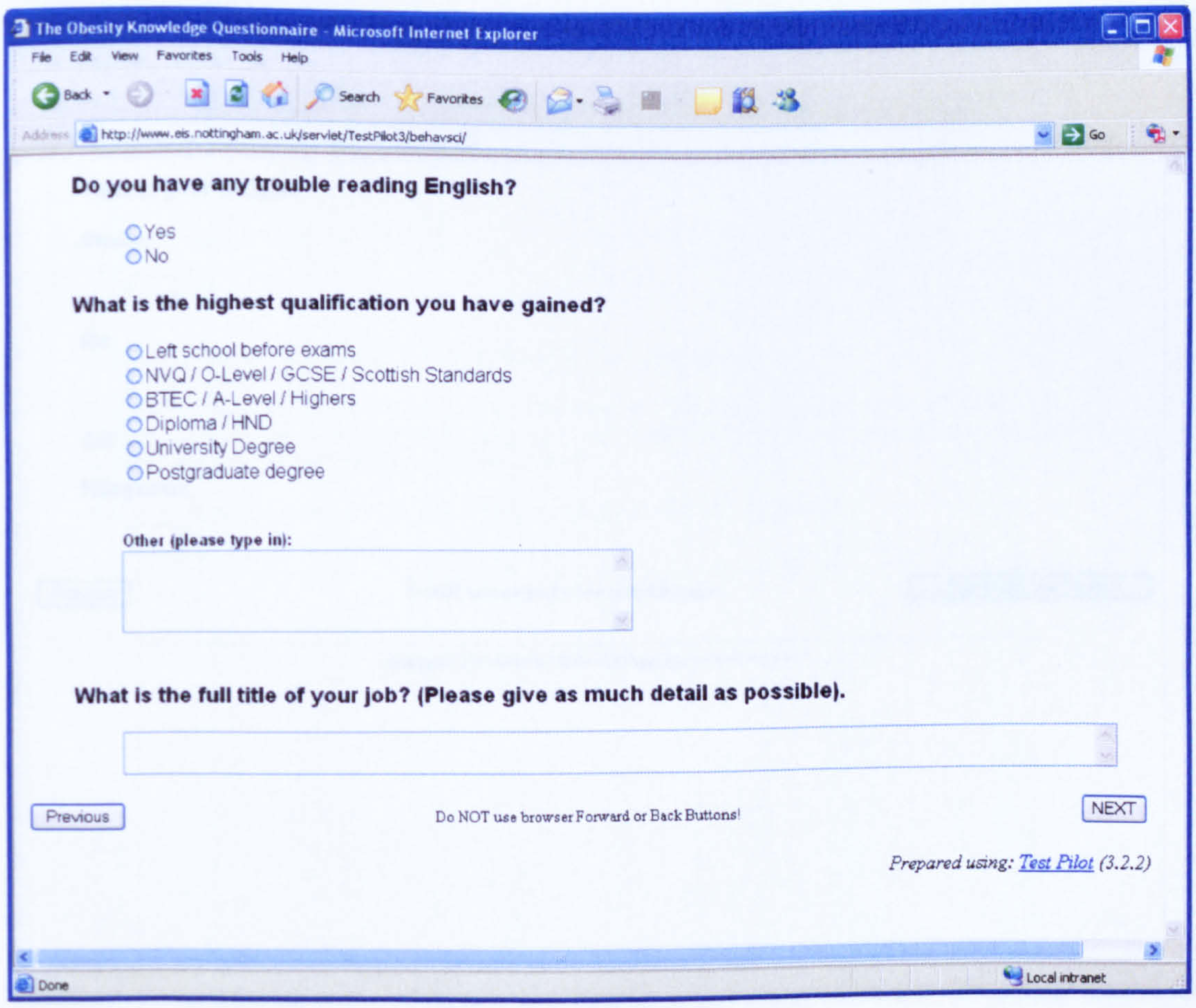

The Obesity Knowledge Questionnaire - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://www.eis.nottingham.ac.uk/servlet/TestPilot3/behavsci/

Do you have any trouble reading English?

- Yes
- No

What is the highest qualification you have gained?

- Left school before exams
- NVQ / O-Level / GCSE / Scottish Standards
- BTEC / A-Level / Highers
- Diploma / HND
- University Degree
- Postgraduate degree

Other (please type in):

What is the full title of your job? (Please give as much detail as possible).

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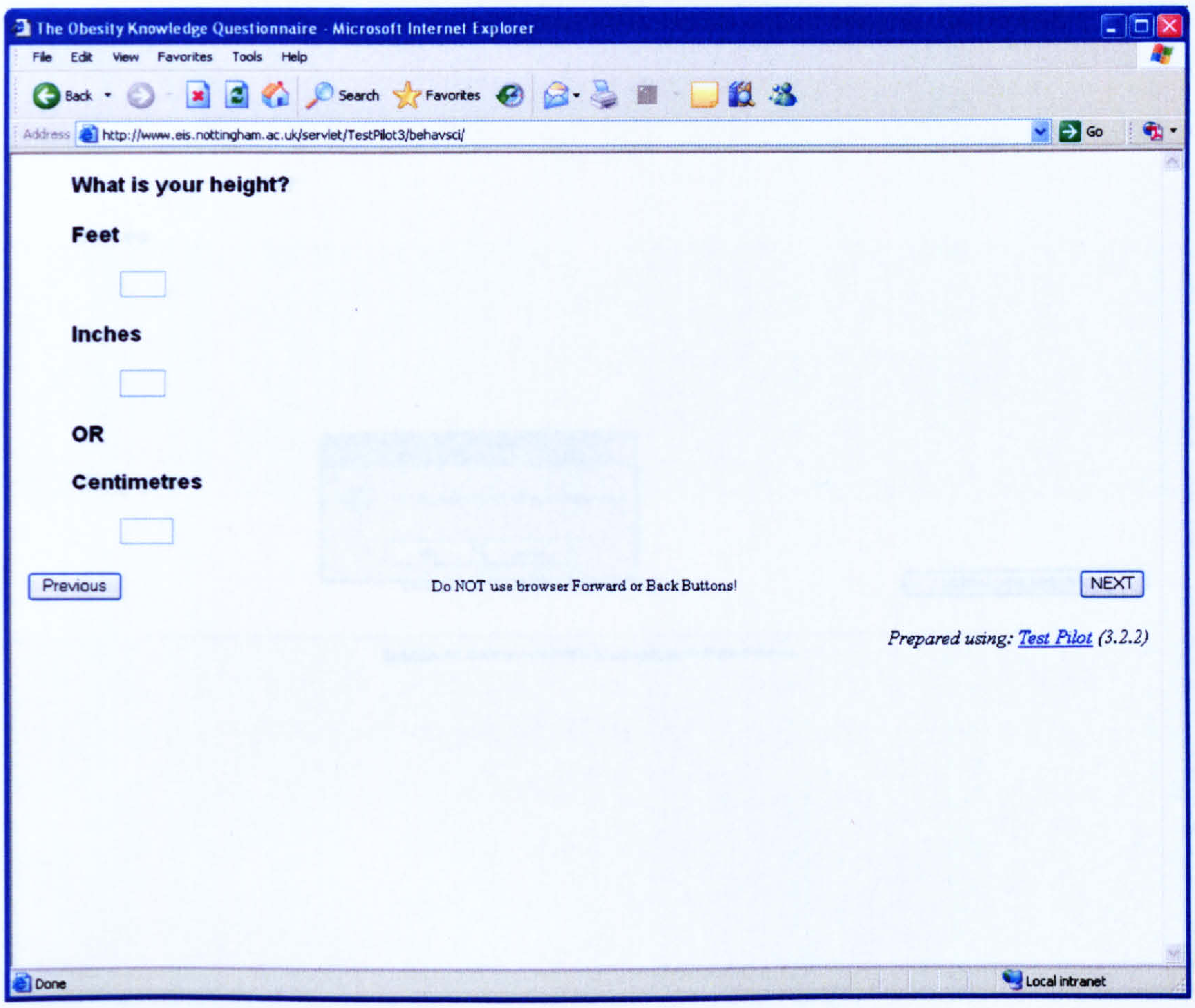
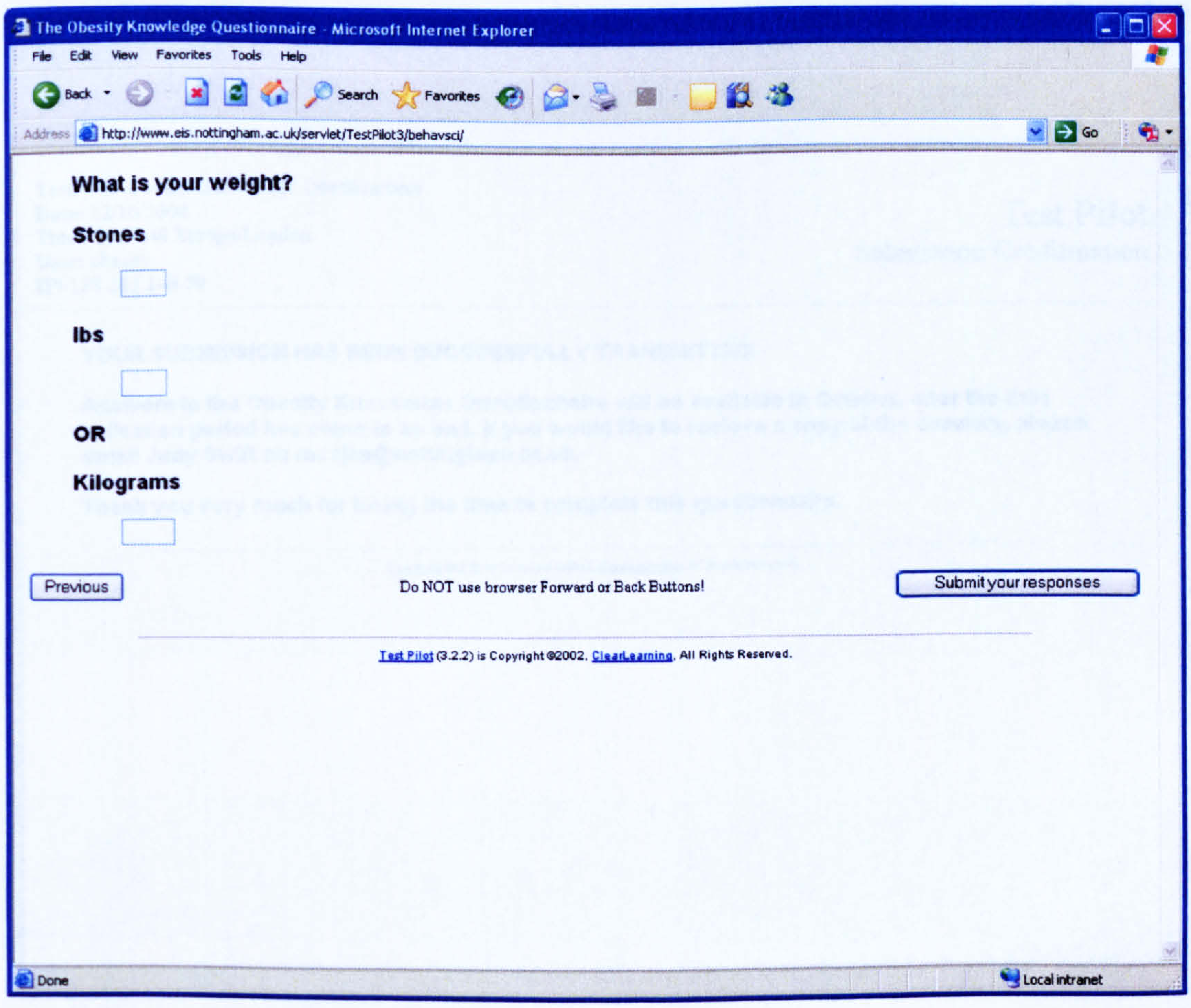

The Obesity Knowledge Questionnaire - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.eis.nottingham.ac.uk/servlet/TestPilot3/behavsci/
Go
What is your height?
Feet
Inches
OR
Centimetres
Previous
Do NOT use browser Forward or Back Buttons!
NEXT
Prepared using: Test Pilot (3.2.2)
Done
Local intranet


The Obesity Knowledge Questionnaire - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.eis.nottingham.ac.uk/servlet/TestPilot3/behavsci/
Go
What is your weight?
Stones
lbs
OR
Kilograms
Previous
Do NOT use browser Forward or Back Buttons!
Submit your responses
Test Pilot (3.2.2) is Copyright ©2002, ClearLearning, All Rights Reserved.
Done
Local intranet

The University of Nottingham

in association with John Lewis, Solihull

An investigation into BELIEFS ABOUT OBESITY AND BODYWEIGHT CONTROL

This survey asks you to respond to a series of questions about obesity and body weight control. It also contains some questions about yourself but it does not ask for your name and all information provided will be kept in the strictest confidence.

It should not take any longer than 10 minutes to complete.

If you would like to take part in this survey, please be sure to complete every question otherwise we will not be able to include your views in the final analysis.

In order to obtain an accurate representation of people's views, it is important that you complete the questionnaire before you discuss the questions or your answers with any one else. Often there are no right or wrong answers - we just want to hear about **your** opinions.

When you have completed the questionnaire, please return in the freepost envelope provided at your earliest convenience.

Thank you very much for your time

SECTION ONE

Please place a tick ☑ in the appropriate box to indicate the extent to which you agree with each of the following statements.

There are seven options to choose from:

Strongly agree	Agree	Moderately agree	Neither agree nor disagree	Moderately disagree	Disagree	Strongly disagree

	Strongly agree	Agree	Moderately agree	Neither agree nor disagree	Moderately disagree	Disagree	Strongly disagree
1. An obese person needs more medical care.	☐	☐	☐	☐	☐	☐	☐
2. People have to deny themselves a great deal to avoid obesity.	☐	☐	☐	☐	☐	☐	☐
3. An ideal bodyweight is more socially acceptable.	☐	☐	☐	☐	☐	☐	☐
4. Maintaining an ideal bodyweight is expensive.	☐	☐	☐	☐	☐	☐	☐
5. There is nothing more important than good health.	☐	☐	☐	☐	☐	☐	☐
6. People should maintain an ideal bodyweight for optimal health.	☐	☐	☐	☐	☐	☐	☐
7. Obese people would be treated better if they lost weight.	☐	☐	☐	☐	☐	☐	☐
8. Maintaining an ideal bodyweight is boring.	☐	☐	☐	☐	☐	☐	☐
9. If you don't have your health, you don't have anything.	☐	☐	☐	☐	☐	☐	☐
10. People with an ideal bodyweight are taken more seriously.	☐	☐	☐	☐	☐	☐	☐
11. Losing weight would greatly improve obese people's health.	☐	☐	☐	☐	☐	☐	☐
12. Maintaining an ideal bodyweight takes a lot of effort.	☐	☐	☐	☐	☐	☐	☐
13. Good health is only of minor importance in a happy life.	☐	☐	☐	☐	☐	☐	☐
14. Obese people would have a better social life if they lost weight.	☐	☐	☐	☐	☐	☐	☐
15. A person with an ideal bodyweight can lead a more active life.	☐	☐	☐	☐	☐	☐	☐
16. Maintaining an ideal bodyweight makes life less fun.	☐	☐	☐	☐	☐	☐	☐
17. Very overweight people are considered less attractive.	☐	☐	☐	☐	☐	☐	☐
18. Losing weight affects an obese person's identity.	☐	☐	☐	☐	☐	☐	☐
19. There are many things I care about more than my health.	☐	☐	☐	☐	☐	☐	☐
20. Very overweight people have poorer job prospects.	☐	☐	☐	☐	☐	☐	☐
21. A person who avoids obesity has a restricted lifestyle.	☐	☐	☐	☐	☐	☐	☐
22. Obese people are embarrassed by the way they look.	☐	☐	☐	☐	☐	☐	☐

SECTION TWO

For the following questions, please place a tick ☑ in the appropriate box to indicate whether you think the statements listed below are true or false. If you are unsure of the answer to a question, please tick the 'don't know' box.

		TRUE	DON'T KNOW	FALSE
1.	Medical advice is that obese people should lose weight slowly, less than 2lbs (1kg) a week.	☐	☐	☐
2.	A person with a 'beer-belly' shaped stomach has an increased risk of getting diabetes.	☐	☐	☐
3.	Obesity increases the risk of getting bowel cancer.	☐	☐	☐
4.	An obese person who gets diabetes needs to lose at least 40% of their bodyweight for clear health benefits.	☐	☐	☐
5.	Obese people can expect to live as long as non-obese people.	☐	☐	☐
6.	Obesity increases the risk of getting breast cancer after the menopause.	☐	☐	☐
7.	Obesity is more of a risk to health for people from South Asia (e.g. India and Pakistan) than it is for white Europeans.	☐	☐	☐
8.	There is **no** major health benefit if an obese person who gets diabetes, loses weight.	☐	☐	☐
9.	Obesity does **not** increase the risk of developing high blood pressure.	☐	☐	☐
10.	It is better for a person's health to have fat around the hips and thighs than around the stomach and waist.	☐	☐	☐
11.	Rapid weight loss in obese people is **not** associated with any health problems.	☐	☐	☐
12.	Obesity increases the risk of getting a food allergy.	☐	☐	☐

SECTION THREE

Please place a tick ☑ in the appropriate box to indicate the extent to which you agree with each of the following statements.

		Strongly agree	Agree	Moderately agree	Moderately disagree	Disagree	Strongly disagree
1.	Whether I gain, lose or maintain my weight is entirely up to me.	☐	☐	☐	☐	☐	☐
2.	No matter what I intend to do, if I gain or lose weight, or stay the same in the near future, it is just going to happen.	☐	☐	☐	☐	☐	☐
3.	Being the right weight is largely a matter of good fortune.	☐	☐	☐	☐	☐	☐
4.	If I eat right and get enough exercise and rest, I can control my weight in the way that I desire.	☐	☐	☐	☐	☐	☐

And finally a few things about yourself...

What is your sex? Female ☐ Male ☐

What is your date of birth? __ __ / __ __ / 19 __ __

What is your marital status?
Single ☐ Divorced / separated ☐
Married / co-habiting ☐ Widowed ☐

What is your ethnic background?
White British / European ☐ Black / Black British ☐
Asian / Asian British ☐ Chinese ☐
Mixed and other backgrounds (please write in): ______________________

Do you have any trouble reading English? Yes ☐ No ☐

What is your employment status?
Full-time ☐ Unemployed ☐
Part-time ☐ Retired ☐

What is the **full title** of your job? ______________________
(please give as much detail as possible) ______________________

What is the **highest** qualification you have gained?
Left school before exams ☐ Diploma / HND ☐
NVQ / O-level / GCSE / Scottish Standards ☐ University degree ☐
BTEC / A-level / Highers ☐ Postgraduate degree ☐
Other (please write in): ______________________

What is your height? __ __ feet __ __ inches **or** ____ centimetres

What is your weight? __ __ stone __ __ lbs **or** ____ kilograms

What is your ideal weight?	__ __ stone	__ __ ibs	**or**	___ kilograms		

How would you describe your weight?	Underweight	☐	Overweight	☐
	Recommended weight	☐	Very overweight / obese	☐

How much do you think your weight affects your health?	Not at all	☐	A little	☐	A lot	☐

Are you currently trying to maintain your weight?	Definitely yes	☐	Somewhat yes	☐	No	☐

Are you currently trying to lose weight?	Definitely yes	☐	Somewhat yes	☐	No	☐

How much did you weigh 6 months ago?	__ __ stone	__ __ lbs	**or**	____ kilograms

Are there any special circumstances which have affected your weight over the past 6 months?
(please give as much detail as possible)

____

Do you intend to maintain your weight in the future?	Definitely yes	☐	Somewhat yes	☐	No	☐

Do you intend to lose weight in the future?	Definitely yes	☐	Somewhat yes	☐	No	☐

THANK YOU VERY MUCH FOR YOUR TIME

Please return in the freepost envelope provided at your earliest convenience