**CHAPTER 1**

**Introduction**

* 1. **Obesity**

Overweight and obesity are defined as abnormal or excessive fat accumulation that present a risk to health (World Health Organisation (WHO), 2014). The most common method of measuring obesity is the Body Mass Index (BMI) which is calculated by dividing a person’s weight measurement (in kilograms) by the square of their height (in metres). In adults, a BMI of 25kg/m2 to 29.9kg/m2 means an individual is considered to be overweight, and a BMI of 30kg/m2 or above is considered to be obese (Health and Social Care Information Centre (HSCIC), 2014). The measurement of overweight and obesity among children needs to take account of the different growth patterns among boys and girls at each age. The British 1990 growth reference (UK90) uses a BMI threshold for each age above which a child is considered overweight (above the 85th centile) or obese (above the 95th centile) (HSCIC). BMI offers the best measure of the prevalence of obesity at the population level and is therefore the most frequently used measure (HSCIC).

* + 1. *Prevalence*

The increase in obesity over the last 30 years has been described as *“…a pandemic of global proportions.”* (Dovey, 2010, p.112). Whilst obesity or excessive fatness is not a new phenomenon, there has been an increase in obesity in virtually every country in the world (Foresight, 2007). The prevalence of obesity in England is the highest in the EU with the UK dubbed as ‘the fat man of Europe’ (NHS Choices, 2013). The Health Survey for England report (2012) identified a marked increase in the proportion of men and women that were obese; a proportion that has gradually increased over the period from 13.2% in 1993 to 24.4% in 2012 for men and from 16.4% to 25.1% for women. The proportions that were overweight including obese increased from 57.6% to 66.6% in men and from 48.6% to 57.2% in women in the same period (HSCIC, 2014). The most recent statistics available suggest, in England, a large proportion of the population are overweight or obese. This includes 61.9% of adults and 28% of children aged between 2 - 15 years (Department of Health, 2013).

The Health Survey for England report on population-level data and identified a steady increase in the prevalence of obesity in children since 1995, when 11% of boys and 12% of girls aged 2-15 were obese, until 2005, where obesity peaked at 18% to 19% among both boys and girls. Levels were slightly lower than this peak in the last few years, with little change, with 17% of boys and 16% of girls obese in 2011. Levels in 2012 have fallen, at 14% for both boys and girls, which were lower than in 2011 though not statistically significant (HSCIC, 2014).

The National Child Measurement Programme (NCMP) for England involves a high-level analysis of the prevalence of ‘underweight', ‘healthy weight', ‘overweight', ‘obese' and 'overweight and obese combined' children, in Reception (aged 4–5 years) and Year 6 (aged 10–11 years). The NCMP was set up in 2006 for a number of reasons including: gathering population-level data to allow analysis of trends in growth patterns and obesity, inform local planning and delivery of services for children, increase public and professional understanding of weight issues in children, and to engage with children and families about healthy lifestyles and weight issues (HSCIS, 2014). The results for the school year 2010/11 show that in Reception, over a fifth (22.6%) of children measured were either overweight or obese and in Year 6, this rate was one in three (33.4%). The key findings from the NCMP 2012/13 school year indicate a slight reduction of the proportion of obese children in Reception (9.3%) than in 2011/12 (9.5%). In Year 6 the proportion of obese children (18.9%) was lower than in 2011/12 (19.2%) but higher than in 2006/07 (17.5%).This is the first time since the NCMP collection began in 2006/07 that the prevalence of overweight including obese has reduced for Year 6 children but further data in subsequent years will be required to identify whether this is a true decline in obesity rates. In relation to obesity specifically, the percentage of obese children in Year 6 is over double that in Reception which suggests there is an upward trend related to age and the increased incidence of obesity (HSCIC, 2014b) remains consistent for each year of measurement obtained.

The Foresight report (2007) warned that if obesity rates in children and adults continue to rise, it is likely that over half of the UK population could become obese. Although the rates may have levelled off, the current rates of obesity are still considered to be of concern due to the various associated costs.

*1.1.2 Costs*

The costs associated with obesity are vast and include costs to both the individual and to society. On an individual level, obesity increases the risk of respiratory disorders such as asthma, joint problems, high blood pressure (Flint, Smith & Caborn, 2004), coronary artery disease, stroke, certain cancers, type 2 diabetes, and reduces life expectancy by on average 9 years (Department of Health, 2011; Foresight, 2007).

Obese individuals are also at risk of emotional damage and psychological health risks include stigmatization, poor self-esteem, depression, poor social functioning, bullying and social exclusion (Department of Health, 2011; Flint et al., 2004).

Obesity also has serious economic costs. The approximate cost of obesity and overweight for England in 2002 was estimated at £7 billion (Foresight, 2007). Excess weight costs the NHS more than £5 billion each year (Department of Health, 2013). Indirect costs also impact on society as obese individuals suffer from higher levels of sickness and absence from work (Foresight). The costs to society extend to sickness absences of £2.3-3.6 billion and state benefits range from £1-6 billion (House of Commons Health Committee, 2004). The wider costs to society and business are estimated to reach £49.9 billion per year and the NHS cost of overweight and obesity will rise to £9.7 billion (Foresight) although the National Obesity Forum (2014) warn that this might be an underestimation and increased levels of obesity might exceed 50% of the UK population, as forecast by the Foresight report, thus increasing these costs.

The World Health Organization (WHO, 2014) regards childhood obesity as one of the most serious global public health challenges for the 21st century. Overweight and obese children are likely to stay obese into adulthood and more likely to develop illnesses such as diabetes and cardiovascular diseases at a younger age (WHO). Preventing childhood obesity is considered a high priority, largely because obesity itself can be prevented.

*1.1.3 Causal Factors*

At the most simplistic level, obesity is the storage of energy over and above that expended over a long period (Dovey, 2010). Obesity can be explained as the result of eating more calories than needed and/or undertaking too little physical activity to match calorie intake resulting in the accumulation of excess body fat (Department of Health, 2011).

This simplistic explanation of obesity might lead to the conclusion that the individual is to blame for their weight gain but the true causes of obesity are related to multiple, potential influences on the energy balance equation (Dovey, 2010). The Foresight programme (2007) was commissioned by the UK government to identify a sustainable response to obesity over the next 40 years. The report revealed that the causes of obesity are embedded in a complex biological system, set within an equally complex societal framework. A systems mapping approach identified this ‘energy (im)balance’ to be determined by a complex multifaceted system of determinants where no single influence dominates.

[Content removed for copyright reasons]

***Figure 1.*** Determinants of obesity based on systems map (Retrieved from National Obesity Observatory, 2014)

The obesity system map has energy balance at its heart with 108 variables that directly or indirectly influence the energy balance. These variables are clustered into different themes which identify biological determinants, environmental factors in relation to activity and food, social influences at an inter-individual level, and psychological factors at an intra-individual level.

Biological causes of obesity lie within the homeostatic system which strives to maintain energy balance to keep the body at a constant weight. Obesity develops when energy intake from food and drink consumption is greater than energy expenditure through the body’s metabolism and physical activity (National Obesity Observatory (NOO), 2014). Food is a fundamental biological necessity and the body has evolved to ensure its needs are met. In the modern world, where there is a surplus of energy-dense, low-cost food, this latent metabolic sensitivity is exposed and will lead to weight gain unless overridden by conscious control (Foresight, 2007). A number of biological explanations have been suggested such as identifying genes linked with obesity (Farooqi & O’Rahilly, 2007) and appetite control via the release of hormones regulating hunger (Speakman, Hambly, Mitchell & Krol, 2007). Some individuals may have a finely tuned appetite control system that precisely regulates energy intake to meet energy needs whereas other individuals may have a poorly tuned system resulting in food intake that is persistently above energy needs, making them more susceptible to obesity (Foresight). There is also some experimental evidence to suggest insufficient sleep may contribute to obesity due to changes in hunger hormones. Short-term sleep restriction appears to impair glucose regulation and if sleep restriction is engaged in frequently, it could lead to obesity via changes in the hunger hormones leptin and ghrelin (Marshall, Glozier & Grunstein, 2008).

The most effective way to prevent weight gain or to lose weight involves a combination of physical activity and diet. Whilst physical activity will maximize fat loss, preserve lean tissue, increase fitness and reduce the risk of coronary heart disease (CHD) (Department of Health, 2004) the importance of eating fruit and vegetables is widely acknowledged as protective against a range of diseases (Rayner & Scarborough, 2005). Diets low in fruits and vegetables and rich in energy dense foods high in fat and free sugars are associated with an increased risk of obesity (WHO, 2003). Environmental factors in relation to activity and diet have also been identified as contributing to onset of obesity.

Behavioural factors such as physical inactivity and unhealthy diets are important factors in influencing weight status (NOO, 2014). Physical activity is a key determinant of energy expenditure and a fundamental part of energy balance and weight control. Regular physical activity can reduce the risk of obesity, as well as many chronic conditions including coronary heart disease, stroke, type 2 diabetes, cancer, mental health problems and musculoskeletal conditions (NOO). Inactivity and lack of fitness is positively associated with the risk of dying from CHD compared with active and fit individuals (Department of Health, 2004). Research shows that maintaining activity throughout life is important in avoiding weight gain. An eight year study of 3 - 5 year old children found that more active children had a lower body mass index (BMI) than less active children (Klesges, Klesges, Eck & Shelton, 1995). Golan and Crow (2004a) identified lower levels of physical activity and daily exercise among children was related to a higher BMI.

In 2011 the Chief Medical Officer recommended that children aged 5 - 15 should be at least moderately active for at least 60 minutes every day. It was also recommended that vigorous intensity activity, including muscle- and bone-strengthening activities, should be undertaken at least three days each week by children (HSCIC, 2014). The most up to date statistics on physical activity demonstrate that a higher proportion of boys than girls aged 5-15 (21% and 16% respectively) were classified as meeting current guidelines of at least one hour of moderately intensive physical activity per day (HSCIC). Among both sexes, the proportion meeting guidelines was lower in older children. The proportion of boys meeting guidelines decreased from 24% in those aged 5-7 to 14% aged 13-15. Among girls the decrease was from 23% to 8% respectively (HSCIC). This downward trend of participation in physical activity as children grow older was also apparent in the 2006 Health Survey for England (HSE) and appears to be a consistent pattern of behaviour over the years. These figures highlight the levels of inactivity in children with more than 75% of children not meeting the recommended guidelines for physical activity.

Sedentary behaviour is not simply the absence of physical activity; rather it is a class of behaviours that involve low levels of energy expenditure such as time spent watching television or other screen time (HSCIC, 2014). The activity environment has increased opportunities to engage in screen time, an activity that has been consistently linked to increased BMI, in both children and adults, independent of physical activity (Sigman, 2012) with a dose-response relationship of each extra hour of watching TV resulting in an additional 1kg of body fat (Jackson, Djafarian, Stewart & Speakman, 2009). Eisenmann, Bartee and Wang (2002) found the more hours spent on sedentary activities such as computer use and television viewing, the higher the prevalence of overweight in children. Figures available for average total sedentary time (excluding time at school) was similar for boys and girls on weekdays (3.3 hours and 3.2 hours respectively) and weekend days (4.2 hours and 4.0 hours respectively) (HSCIC, 2014). There are currently no guidelines for screen time viewing but Sigman has suggested screen time limits of 0.5 – 1 hour for children aged 3-7 years, a 1 hour limit for children aged 7-12 years, 1.5 hours for 12-15 year olds and a 2 hour limit from age 16 onwards, for optimal health. Other factors linked to increased weight due to environmental factors includes fewer opportunities for physical activity due to concerns around personal safety, increase in car ownership, the rise of labour-saving devices and limited access to parks (Foresight, 2007).

In addition to poor activity levels there is a plethora of research linking obesity to diet in general. The food environment is considered obesogenic when a wide variety of palatable and inexpensive food is available at any time of day making it difficult to self-regulate food consumption (DeRidder, DeVet, Stok, Adriaanse & De Wit, 2013). This is exacerbated by the fact that people encounter on average up to 200 food and eating decisions per day (Wansink & Sobal, 2007).

Lack of nutrition knowledge has been identified as a barrier to healthy eating (Parmenter, Waller & Wardle, 2000) and the UK Government have responded to this concern by establishing a food and health action plan (Department of Health, 2005) that aims to improve health by promoting increased fruit and vegetable intake using campaigns such as ‘Eat 5-a-day’ and by providing education on healthier eating using guidelines such as the ‘Balance of Good Health’ (FSA, 2001 as cited in Moynihan et al., 2007). However, despite such nationwide campaigns to increase fruit and vegetable consumption, children continuously fail to meet daily recommendations (HSCIC, 2014; Mushi-Brunt, Haire-Joshu & Elliott, 2007). The typical diet of children in the UK remains one of the worst in Europe (Haerens et al., 2007). The majority of children in the UK are eating less than the recommended five portions of fruit and vegetables a day. The latest statistics from HSE shows that between 2010 and 2011, the percentage of 5 - 15 year old boys consuming five or more portions of fruit and vegetables decreased from 19% to 16%. There was no change for 5 - 15 year old girls between this period, with the percentage remaining at 20%. Overall, the mean number of portions consumed was 3.0 portions for boys and 3.3 portions for girls in 2011 (HSCIC, 2014).

Reasons proposed to explain why children fail to meet daily recommendations of fruit and vegetable consumption include: children’s lack of knowledge of an accurate portion size which results in eating less than the recommended guidelines (Mullarkey, Johnson & Hackett, 2007); inaccurate knowledge of health behaviours (Moynihan et al., 2007); and parents’ perceptions of the cost of fruit and vegetables (Mushi-Brunt, Haire-Joshu & Elliott, 2007). Such factors highlight the interaction between children’s knowledge and beliefs and those of their parents as this may influence whether children consume accurate portions of fruit and vegetables.

In addition to lack of fruit and vegetable consumption, the majority of England consumes more sugar than the recommended 60g per day with soft drinks, sweets and biscuits identified as the main source of sugars in the diet (Department of Health, 2005). Several studies suggest that sugar-sweetened drinks may play a role in the childhood obesity epidemic. Ludwig, Peterson and Gortmaker (2001) found that the chances of 11 and 12 year old children becoming overweight increased by 60% for each serving of sugar sweetened drinks consumed daily and James, Thomas, Caven and Kerr (2004) identified that lowering the consumption of carbonated drinks can lower the prevalence of overweight among 7 - 11 year olds. The WHO (2003) recommends that restriction of free sugars is likely to contribute to reducing the risk of unhealthy weight gain.

Wider societal influences that may promote weight gain include food marketing practices such as special offers or positioning of items near checkouts to encourage impulse purchases (Foresight, 2007). Poor eating habits in children may be encouraged when watching television as they are exposed to commercials for unhealthy foods (Ludwig & Gortmaker, 2004). Peer pressure and culture can also exert a strong influence on people’s eating behaviour and define ‘eating appropriateness standards’. An example of this would be purchasing popcorn when going out to watch a film or eating food to be sociable even when not hungry (DeRidder, DeVet, Stok, Adriaanse & De Wit, 2013).

Thus a number of environmental factors appear to influence dietary consumption and levels of activity. The obesity systems map also identified individual psychology as a determinant of obesity. In the western world where food is more readily available and physical activity is no longer as essential due to the rise of technology and labour saving devices, physical activity and diet becomes a choice (Cullen, 2011). The Foresight report (2007) claims no-one escapes psychological conflict or ambivalence related to a modern society abundant with fatty and sweet foods and the desire to be healthy and/or slim. Psychology processes underpinning this ambivalence and associated with behavioural regulation are outlined later in this chapter.

It is clear that the cause of obesity is not as simple as energy in/energy out. Individuals need to develop active strategies to deal with a multitude of influences in order to prevent weight gain or to deal with efforts to lose weight and maintain weight loss.

* + 1. *Treatment and Interventions*

The distinction between prevention and treatment of obesity is important as, once weight has been gained it is difficult to lose and treatments are of limited effectiveness (Golan & Crow, 2004b). Prevention of obesity is important and requires change at the environment, family and individual level (Foresight, 2007). The obesity system map has highlighted the complexity of obesity with multiple causal factors interacting at a biological, psychological and social level. The strategy to tackle obesity requires *“a comprehensive portfolio of interventions targeting a broad set of variables and different levels within the obesity system”* (Foresight, p.14). The Foresight report concludes that there may not be a huge impact based on each separate component but their complementary and reinforcing action is critical to achieve the shift required to reduce the rising rates of obesity.

The most effective measure to prevent obesity is to target children as healthy behaviours established in childhood are more likely to remain in adulthood (Brown & Summerbell, 2009). Tammelin, Nayha, Hills and Jarvelin (2003) found that individuals who participate in sport as children or adolescents are more likely to continue this into adulthood. Physical activity in childhood also impacts on adult health as it affects biological CVD risk factors through effects on weight (Health Survey for England, 2006). Furthermore, unhealthy behaviours indulged in during childhood often continue into adulthood and healthy behaviour diminishes the older children become (Lindsay, Sussner, Kim & Gortmaker, 2006). Hence preventive interventions are better aimed at children to promote healthy behaviours in order to discourage weight gain later in life.

A range of initiatives have been launched promoting exercise to children with shows such as ‘Lazy Town’ which encourage children to play outside, be active and eat ‘sports candy’ also known as fruit and vegetables (Marshall, O’Donohoe & Kline, 2007); the ‘Eat 5-a-day’ campaign which encourages adults and children to eat at least 5 portions of fruit and vegetables daily (Department of Health, 2005); the Change4Life campaign which encourages adults and children to eat a healthy diet and engage in physical activity (Department of Health, 2011b); and the ‘Food Dudes Programme’ which is a school-based intervention modelling a group of fun, cool and slightly older children and is designed to boost children’s fruit and vegetable consumption (Erjavec, Viktor, Horne & Lowe, 2012). However, these campaigns aimed at improving children’s health are not yet proving successful as various population-level indicators (HSCIC, 2014) demonstrate children still do not eat enough fruit and vegetables and do not engage in sufficient levels of physical activity. One explanation of this could be that current interventions do not target all the underlying factors involved in children’s decision-making processes. It appears children, assuming they have knowledge that physical activity and fruit and vegetable consumption is important, fail to resist the temptation of indulging in unhealthy activities. Further exploration is required to understand children’s knowledge, how they make sense of health information and how they make decisions in relation to healthy and unhealthy choices.

It is generally accepted that obesity is a multifaceted issue that requires a biopsychosocial response but with the exception of cognitive behavioural therapy, psychological issues are not receiving as much attention as sociological and diet issues as a way of dealing with the increase prevalence of obesity (Waumsley, 2011). There is a need for more UK-based research into the prevention and treatment of obesity in children (Cullen, 2011). Psychologists can understand motivations and barriers to increasing activity and decreasing sedentary time (Waumsley & Mutrie, 2011). A number of psychological factors in relation to attitudes, intentions, positive outcome expectancies, risk perception and self-efficacy can help to understand self-regulation and why children may or may not engage in certain behaviours. These psychological factors, along with key psychological theories, will be discussed in more detail below.

* 1. **Psychological theories**

A number of theories and models in psychology explain human behaviour based on the assumption that health-protective and risk behaviours are generally performed for a reason (Ajzen, 1991; Fishbein & Ajzen, 1975). A subjective expected utility theory is a decision-making model where an individual evaluates the usefulness of certain actions and their outcomes and selects the action with the highest utility. This approach assumes individuals are rational decision makers (Fishbein & Ajzen). Social cognitive theories explain social knowledge and behaviour by highlighting the explanatory role of cognitive factors such as beliefs and attitudes. These models assume that social behaviour is determined by a person’s beliefs about behaviours in certain social contexts based on perceptions, expectations, and not simply their attitudes alone (Bandura, 1977). Each theory identifies factors that can contribute to the likelihood of performing a health behaviour but theories ‘borrow’ or adapt concepts from other theories in an effort to build a stronger model to explain human behaviour (Ragin, 2011). A detailed overview of psychological theories and models is beyond the scope of this chapter. However, it is important to consider key psychological constructs and their implications for obesity.

Bandura proposed social cognitive theory (SCT) (1977) which identified a number of core concepts that are critical to the acquisition and regulation of behaviour. These are observational learning/modelling, self-regulation, goal setting, outcome expectations and self-efficacy. Behaviour is thought to be learned from the environment through the process of observational learning through role models and positive and negative experiences of behaviour (Bandura). Self-regulation involves a cognitive and behavioural process of guiding one’s thoughts and actions to achieve a goal (Bandura). Self-regulation involves goal-setting; goals have the ability of focusing an individual’s attention, and cognitive and emotional regulation (modifying or controlling thoughts and emotions) is required to execute goal-directed behaviour (Morrison & Bennett, 2012). Three sub-processes are involved in self-regulation according to SCT which include self-observation (the ability to monitor own behaviour), self-judgment (evaluation of whether or not actions are effective) and self-reaction (behavioural modification in response to evaluations based on self-judgement) (Bandura, 1991). Outcome expectations reflect individuals' beliefs about the consequences of behaviours that are performed. They are formed based on past experiences, learned behaviour, and they are important as they shape the decisions an individual will make about which behaviour to engage in, with an increased likelihood to perform behaviour with a valued outcome and avoidance of behaviour that has an unfavourable outcome expectancy (Bandura, 1997). Self-efficacy is a key construct in SCT which is defined as an individual’s belief that his/her actions will produce the expected outcome (Fagin, 2011). High self-efficacy is linked to the setting of high personal goals, positive outcome expectancies and reduced anxiety whereas low perceived self-efficacy is linked with reduced confidence in the ability to perform behaviour. Self-efficacy is linked with previous experiences and learned behaviour from the environment (Bandura) and it is often the single SCT construct that is the focus of dietary change and weight control interventions (Conner & Armitage, 2002).

An early model of health behaviour change is the health belief model (HBM) (Rosenstock, 1974) which is a predominantly cognitive model derived from subjective expected utility theory (Morrison & Bennett, 2012). The HBM seeks to explain and predict an individual’s health behaviour using the individual’s own subjective frame of reference based on five key concepts: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action (Ragin, 2011). Perceived susceptibility is the degree to which an individual feels at risk of catching a disease or illness and perceived severity is the subjective value of how serious an individual assesses the seriousness of the disease or illness. When these two constructs are combined, a high perceived susceptibility to, and high perceived severity of disease, should result in a strong perceived threat of disease and result in behaviour change (Ragin). Identifying perceived benefits involves a subjective assessment of physical and psychological costs of adopting a particular behaviour and perceived barriers identify the costs associated with adopting a particular behaviour such monetary costs, time, effort or stigma. Perceived barriers have been identified as the strongest predictor of adopting preventive health behaviours (Janz & Becker, 1984). Cues to action are reminders that prompt an individual to act in accordance with their intention, these can be internal cues such as feeling tired, or external cues such as health promotion campaigns. The HBM has been developed over the years with additional factors added to it such as the influence of demographic factors such as age, gender, culture, socioeconomic status and psychosocial factors such as peer pressure (Marks, Murray, Evans & Estacio, 2011). It offers a good explanation for predicting behaviours where the perceived threat of disease is high and barriers are low (Harrison, Mullen & Green, 1992) but other social cognitive theories have identified psychological constructs that can offer stronger explanations of behaviour such as the Theory of Planned Behaviour (TPB) (Wiggers, De Wit, Gras, Coutinho & Van Den Hoek, 2003).

Underpinning the development of the TPB is the assumption that individuals behave in a goal-directed manner and that the outcome expectations of behaviour are weighed up in a rational manner before the decision is taken whether to engage in the behaviour or not (Morrison & Bennett, 2012). The TPB is an extended model of the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). According to the TRA, the best predictor of behaviour is the person’s intention to perform the behaviour and intentions are influenced by two factors: attitude about the behaviour and the subjective norm or perceived social pressure to carry out a particular behaviour (Ajzen & Fishbein). Attitudes are formed based on ‘behavioural beliefs’ that engaging in a particular behaviour will result in a salient outcome and the positive or negative evaluation of these beliefs are known as ‘outcome evaluations’ (Ajzen & Fishbein). For example, attitudes towards cake consumption could be negative because behavioural beliefs of cake consumption leading to weight gain could be evaluated as a negative outcome. Promoting dietary change could involve changing attitudes as Anderson and Shepherd (1989) found that attitude was a significant predictor of healthier eating in an adult sample. However, the role of attitude strength is limited as attitudinal ambivalence increases, the attitude-behaviour relationship decreases (Conner, Povey, Sparks, James & Shepherd, 2003). Subjective norms influence intention as the perception of social pressure regarding a behaviour informs their motivation to comply with ‘significant others’. For example, selecting fruit and vegetables as a snack choice because peers express a preference towards this and not cake.

The TRA was expanded to include the concept of perceived behavioural control (PBC) which is related to individual’s appraisals of their ability to perform a behaviour (Ajzen, 1991). PBC is underpinned by control beliefs about perceptions of obstacles, impediments, skills, resources and opportunities that may inhibit or facilitate performance of behaviour (Ajzen). This is similar to Bandura’s (1997) concept of self-efficacy which is the idea that the more confident you are in your own ability to eat a healthy diet, the more likely you are to do so (Conner & Armitage, 2002). The model proposes that PBC will directly influence intention and thus, indirectly behaviour, but a direct relationship between PBC and behaviour is also possible if perceptions of control are accurate. Attitudes, PBC and intentions have been found to influence children’s physical activity intentions (Hagger, Chatzisarantis, Biddle & Orbell, 2001). Additional constructs have been suggested in addition to the TPB constructs and these include anticipatory regret and implementation intentions. Anticipatory regret is an anticipated consequence when a certain behavioural decision is thought to have an undesirable future outcome (Conner, Sandberg, McMillan & Higgins, 2006). For example, eating cake will make an individual gain weight which is an undesirable outcome. This can increase an individual’s intention to perform or not perform a particular behaviour, e.g. develop the intention to abstain from eating cake. However, an intention-behaviour gap exists where individuals do not translate their intentions into action (Sutton, 1998). Implementation intentions (IIs) are specific ‘when, where and how’ plans that an individual commits to in order to carry out the intended action (Gollwitzer, 1999). IIs have been shown to increase the likelihood of carrying out intended actions and useful in the context of health education and intervention (Gollwitzer & Sheeran, 2006).

Another model which attempts to reconcile the ‘intention-behaviour gap’ is the Health Action Process Approach (HAPA) model (Schwarzer, 1992). The HAPA model has two distinct phases: a pre-intentional motivation phase and a post-intentional volition phase. In the motivational phase, perceived risk, outcome expectancies and self-efficacy inform the construction of goal intentions. Once an intention has been formed, the HAPA proposes that a conscious decision to act is made and an individual enters the volition phase. Action planning or implementation intentions (Gollwitzer, 1999) are important to facilitate the process of turning a goal intention into a specific plan of action. In addition to this factor, action control facilitates uptake of the targeted behaviour (Sniehotta, Nagy, Scholz & Schwarzer, 2006). Action control is a self-regulatory process which involves awareness of standards, self-monitoring and self-regulatory effort (Sniehotta et al.). Self-efficacy is key to HAPA in both the pre-intentional motivational and post-intentional volition phase as an individual’s belief in their ability to articulate goals and belief in their ability to implement their plan increases their ability to achieve health goals (Schwarzer).

Motivation has also been identified as a key psychological construct that can explain behaviour. Intrinsic motivation is guided by internal satisfaction whereas extrinsic motivation is behaviour driven by external outcomes (Deci & Ryan, 2000) such as avoiding punishment. Understanding differing levels of motivation may help understand failure to self-regulate or maintain behaviour (Deci & Ryan).

A number of psychological constructs have been discussed across a number of theories and models and whilst each theory differs slightly, they all share a similar aim which is to understand and explain predictors of positive or negative health behaviours. Morrison and Bennett (2012) identify the need for research to adopt a self-regulatory perspective in relation to health behaviour change as self-regulation is associated with a number of factors such as motivation, self-efficacy, intention and planning. None of these theories explicitly deal with motivational conflict as proposed in relation to the Foresight report (2007) and an obesogenic environment which values slimness and health. A cognitive self-regulatory model of health behaviour has been developed which attempts to explain the underlying psychological mechanisms of dealing with the psychological ambivalence experienced as a result of the obesogenic environment that is now prevalent in the western world. This is the compensatory health belief model (Knauper, Rabiau, Cohen & Patriciu, 2004) and will be discussed further in the next section.

* 1. **Compensatory Health Beliefs**

A theoretical model has been developed by Knauper, Rabiau, Cohen and Patriciu (2004) which outlines the psychological processes involved in compensatory reasoning. The compensatory health belief (CHB) model describes multiple strategies that adults employ to reach equilibrium between maximizing pleasure and minimizing harm when faced with temptations that may compromise health goals.

According to the CHB model, cognitive dissonance, or motivational conflict, arises when faced with temptations and desires such as eating unhealthy food items that conflict with health goals such as not becoming overweight (Rabiau, Knauper & Miquelon, 2006). When this conflict is experienced, it can be alleviated by one of three strategies. The first strategy is to resist the temptation and is more likely to occur when an individual is intrinsically motivated to achieve their health goal or when self-efficacy to control their desire is high. This is a behavioural strategy and is quite effortful requiring self-control when faced with unhealthy but tempting activities (Rabiau et al.).

The second strategy involves adapting the perception of risk or harm caused by the behaviour or re-evaluating outcome expectancies (Rabiau, Knauper & Miquelon, 2006), for example, changing beliefs that the behaviour is not in fact unhealthy i.e. eating cake is not unhealthy, or there is no risk of negative health outcomes such as weight gain, which minimises the cognitive dissonance experienced, resulting in consumption of cake, guilt-free. This is a cognitive strategy and again is quite effortful requiring modification of beliefs or health goals to reduce the motivational conflict. This strategy can be understood further in terms of risk perception. Research shows that people tend to perceive their risk of harm to be below average. Weinstein (1980) called this type of risk perception ‘unrealistic optimism’ because although some people’s risky behaviour might be below average, it is unrealistic for everyone’s risk to fall below average. Greening, Stoppelbein, Chandler and Elkin (2005) report that children and adolescents are prone to unrealistic optimism because as they move from concrete to abstract thinking, their thinking becomes more self-focused and egocentric, that is, they tend to think they are unique, hence they cannot be vulnerable to health risks like the typical average person, and guided by such beliefs may indulge in unhealthy behaviours.

The third strategy is to activate CHBs. CHBs are defined as ‘*…beliefs that the negative effects of an unhealthy behaviour can be compensated for, or “neutralized” by engaging in a healthy behaviour.*’ (Knauper, Rabiau, Cohen & Patriciu, 2004, p.607). For example, “I will eat this cake now because I will go to the gym later.” Rabiau, Knauper & Miquelon (2006) argue this is the easiest path that can be followed because it involves the *‘best of both worlds’* (p.142). The belief that an unhealthy behaviour that might compromise health goals, such as eating cake, can be indulged in if it is compensated for by carrying out another healthy behaviour such as, going to the gym to remove the additional calories consumed. Health goals are not compromised and it is possible to indulge in the desired behaviour without any feelings of guilt or discomfort (Rabiau et al.). This strategy allows the individual to acknowledge the risk involved in engaging in the unhealthy behaviour, and so behaviour is not due to a lack of knowledge of risk. The activation of CHBs has been described as an automatically motivated regulatory process to reduce cognitive dissonance by justifying unhealthy behaviour with future planned behaviour (Radtke & Scholz, 2012). CHBs can be automatically elicited by temptations or generated after indulgence, in a post hoc rationalisation, to minimise conflict (Kronick & Knauper, 2010).

Rabiau, Knauper & Miquelon (2006) propose that once the CHB has been activated, in order for it to successfully reduce the motivational conflict, it requires the creation of an implementation intention (Gollwitzer, 1999) to actually perform the compensatory behaviour. Implementation intentions are self-regulatory strategies that involve making a detailed plan of a future situation, for example, *‘I will go to the gym at 7pm after work and use the treadmill for twenty minutes’.* Once the plan has been developed, if self-efficacy is high and individuals think they are capable of carrying out the compensatory health behaviour specified in their CHB plan, they will carry it out, reducing the motivational conflict as the negative effects of the unhealthy behaviour are believed to have been neutralised. If self-efficacy is low, there is less chance the compensatory behaviour will be performed and this will result in a continued state of conflict until either: the compensatory behaviour is completed, risk perceptions are altered or the state of conflict diminishes with time (Rabiau et al.).

Rabiau, Knauper & Miquelon (2006) suggest that overall the tendency to engage in CHBs is associated with negative health outcomes over time for two key reasons. Firstly, the construction of a CHB could be inaccurate or maladaptive. A maladaptive CHB is an incorrect belief of a behaviour that can compensate for the negative health outcomes of a different behaviour. An example of a maladaptive CHB is the belief that the negative health outcome of cake consumption i.e. additional calories can be minimised by eating fruit as the additional calories cannot be eliminated from consuming fruit. An accurate or adaptive CHB identifies a compensatory behaviour which can compensate for the negative health outcome of an unhealthy behaviour, such as going to the gym to burn off additional calories consumed from cake consumption, if the compensatory behaviour is performed, then there is an overall positive health outcome of holding CHBS (Rabiau et al.). It can be difficult to distinguish between an accurate and inaccurate CHB because an unhealthy behaviour can have multiple effects and a compensatory behaviour may only eliminate one of the negative effects. This could be considered a partially accurate CHB (Rabiau et al.), for example, skipping a meal as a result of consuming cake. This is partially adaptive as calorie intake is reduced to make up for the highly calorific cake but results in an unhealthy diet that is missing key nutrients from healthier food choices.

CHBs are also associated with poorer health outcomes because even where CHBs are accurate, some individuals may fail to follow through with the behaviour. Previous research demonstrates that compensatory intentions (CI) are predictive of caloric intake as CHBs and intentions prompt the consumption of indulgent food in dieters (Kronick, Auerbach, Stich & Knauper, 2011). The majority of dieters who formed CIs failed to follow through with their plans to compensate (Miquelon, Knauper & Vallerand, 2012; Rabiau et al., 2009). Thus holding CHBs and forming CIs present a risk factor for diet-nonadherence, as an unsuccessful plan to compensate that leads to diet breaking can lead to a sustained increase in caloric intake (Kronick et al.). Knauper, Rabiau, Cohen and Patriciu (2004) found that individuals with a BMI of 27 or more, which is indicative of overweight or obesity, hold more CHBs than non-overweight or obese individuals. Whilst developing and validating a psychometric scale to measure CHBs, they also found that individuals who tend to use CHBs in one health domain were likely to use CHBs other health domains which include: substance use, eating or sleeping habits, stress, and weight regulation. Miquelon, Knauper & Vallerand (2012) tested the motivational determinants and consequences of compensatory beliefs in weight-loss dieting. They found that individuals who engage in goal-directed behaviours for more autonomous reasons form fewer CHBs because they are better able to resist temptations that are interfering with their self-set goals. Radtke, Kaklamanou, Scholz, Hornung and Armitage (2014) identified a relationship between diet-specific CHBs and intention which was moderated by risk perception. Diet-specific CHBs positively predicted intention in women with high risk perception but not low risk perception. CHBs may play different roles at different stages of the health-behaviour change process (Radtke et al.).

CHBs are also associated with unfavourable outcomes in medical diet needs. Activation of a CHB and subsequently carrying out a compensatory behaviour in coronary heart disease patients is directly related with unhealthy eating habits such as excessive salt, fat and sugar consumption (Taut & Baban, 2008). Holding CHBs is detrimental to health beyond diet and exercise. Ernsting, Schwarzer, Lippke and Schneider (2012) found during a theory guided intervention promoting influenza vaccination at the workplace, CHBs mediated between intention and behaviour. Individuals with low intentions were more likely to hold CHBs than individuals with high intentions to obtain a flu vaccination.

CHBs have been included in interventions aimed at promoting healthy food consumption. CHBs could be a potentially negative side effect of diet-related CHBs in response to nutritional interventions aimed at preventing overweight and obesity. When attempting to reduce dietary consumption with an increased awareness of portion sizes and the use of front-of-package logos, research indicates that compensation behaviour is a resulting side-effect of such interventions (Poelman, Vermeer, Vyth & Steenhuis, 2013) and is associated with increased food consumption. Wammes, French and Brug (2007), however, argue that the concept of compensation is not always unfavourable in weight maintenance as compensatory behaviour can be used in response to overeating or ‘overbalanced’ energy intakes. The Netherlands Nutrition Centre developed the ‘balance intervention’ which aimed to promote caloric compensation by moderating food intake or increasing physical activity in response to overeating in order to maintain a neutral energy balance. They found that the balance intervention materials were associated with more positive attitudes, intentions and self-reported compensatory caloric restriction in response to overeating (Wammes, Breedveld, Kremers & Brug, 2006).

CHBS have also been identified in an adolescent population and, consistent with the majority of adult literature, are associated with poorer health outcomes. Rabiau, Knauper, Nguyen, Sufrategui and Polychronakos (2009) found that CHBs interfered with treatment adherence and adolescents holding maladaptive CHBs were associated with poorer blood glucose control and poorer adherence to self-care behaviours than adolescents holding adaptive compensatory beliefs. Rabiau et al. argued that specifically targeting CHBs in a diabetes intervention by promoting adaptive compensatory beliefs could improve adherence to treatment which would result in the long-term health of this population. CHBs have also been identified in smoking behaviour of adolescents (Radtke, Scholz, Keller, Knauper & Hornung, 2011). Radtke, Scholz, Keller and Hornung (2012) found that smoking-specific CHBs were negatively related to the intention to quit smoking over and above standard predictors of the Health Action Process Model (HAPA; Schwarzer, 1992) including risk perception, positive outcome expectancies, self-efficacy, intention, action planning and self-reported smoking behaviour. Berli, Loretini, Radtke, Hornung and Scholz (2014) found that holding CHBs is counterproductive for physical activity in adolescents, as higher CHBs are associated with lower intentions to be physically active over a two week period.

CHBs have been demonstrated across a range of health-related behaviours in adults and adolescents. CHBs are associated with negative health outcomes due to the inaccuracy of some of these beliefs in addition to the likelihood that the compensatory behaviour will not be performed, even after a compensatory behavioural intention has been developed. Understanding the belief-behaviour gap is the next stage of research exploring CHBs in an adult and adolescent population. Using a think aloud study Kaklamanou, Armitage and Jones (2013) tested the adult CHB scale to assess difficulties people may experience when completing the scale and explored how compensatory beliefs and compensatory behaviours may relate to one another. Kaklamanou et al. propose three ways in which people use CHBs: they state an individual may hold a belief in a CHB but do not engage in any compensatory behaviour; an individual may state a belief in a CHB and also engage in compensatory behaviours; or an individual may state no belief in a CHB, but engage in compensatory health behaviours. Adult research will need to explore this further to enhance understanding of how CHBs are used in relation to health behaviour. Recognising different types of CHBs and behaviour relationships may assist our understanding of why some individuals fail to modify behaviour successfully and has implications for obesity research, and whilst described as an adult and adolescent reasoning strategy, it may also apply to children.

Activating CHBs has been demonstrated in an adult and adolescent population but there is currently no published research exploring CHBs in children. It is important to understand whether younger children also hold CHBs, particularly as previous research largely associates compensatory reasoning with poorer health outcomes.

* 1. **Children’s health beliefs**

Effective health promotion strategies must begin at the time during which the individual is developing an understanding of health and behaviour; forming attitudes and behaviour patterns in relation to a healthy lifestyle, and developing the psychological autonomy and cognitive capacity necessary for decision making and action taking (Maddux, Roberts, Sledden & Wright, 1986). As outlined earlier, attitude is based on behavioural beliefs and is key to understanding why individuals develop intentions to engage in healthy and unhealthy behaviours (Ajzen, 1991).

Wellman, Cross and Watson (2001) argue that children achieve an understanding of the role of beliefs in motivating action between the ages of 3-4 years. Research in the domain of developmental psychology focuses on the development of children’s mental states. Whilst this is important, it was beyond the scope of discussion in this programme of research. Children’s application of mental states to health beliefs was researched based on the assumption that children demonstrate a rudimentary understanding of intention, desire and belief in the toddler years and from the age of 3-4 years can understand that such mental states represent the state of the world, either accurately or inaccurately (Siegler & Alibali, 2005).

Research into cognitive and social development explains how children’s health and illness concepts develop and the range of factors that can influence the beliefs children hold (Turner-Cobb, 2014). Cognitive development is defined as the sequence of changes that occur to cognition, such as mental processes responsible for learning, thought and communication which occurs as a person matures (Zeinstra, Koelen, Kok & de Graaf, 2007). Children’s understanding of health concepts undergoes significant developmental changes based on their cognitive competence and so it is very important to understand causal processes in childhood (Piko & Bak, 2006). Social cognitive theorists view children as active information processors who construct a coherent model of their world based on learned experiences through the process of providing feedback from self-evaluation in order to improve attempts to self-regulate behaviour (Bronson, 2000). Other theorists have analysed children's concept of health within a framework of age related development stages derived from a Piagetian framework (Natapoff, 1978; Bibace & Walsh, 1980) which assumes self-regulation develops based on interaction with the environment but within biological constraints imposes by different stages of brain development (Bronson). In contrast to this approach, Vygotsky (1978) emphasized the role of the social and cultural environment in shaping self-regulation. He argued that a child ‘co-constructs’ concepts and progresses from co-regulation, assisted by others, to self-regulation using psychological tools such as language, writing and counting, which were acquired from others (Bronson).

Each of these approaches relies on a cognitive model of the child's world of health and assumes that a better understanding of how children think about health will lead to more effective health promotion approaches with children as this will help to identify appropriate methods of changing health knowledge, attitudes and behaviours (Kalnins, McQueen, Backett, Curtice & Currie, 1992). Whilst there are differences in explanations for how children’s cognitive-development differs with age, there is agreement in nearly all of the literature, regardless of its theoretical underpinning, that children’s understanding of health and illness tends to progress the older they get (Carter & Simons, 2014). Previous research has identified increased causal explanations of children’s concepts of the common cold (Bibace & Walsh, 1980; Myant & Williams, 2005), AIDS (Walsh & Bibace, 1991), chicken pox, asthma and toothache (Myant & Williams). Cullen (2011) argues there is a need for an increase in UK-based research that explores psychological causal factors in obesity, in consultation with children and young people, if interventions are to be successful.

The obesity systems map highlights the multifaceted nature of the intrapersonal, interpersonal and environmental influences involved in obesity. It highlights the complex internal and external environment within which self-regulation of behaviour has to occur in order to manage and respond to the health risk that obesity poses. The external environment, comprising interpersonal and environmental influences, is often referred to as an obesogenic environment but the internal environment is less well understood. There are internal biological and genetic factors that relate to obesity risk; however, the largest and least well understood area is the internal psychological environment comprising cognitive processes that relate to individuals self-regulation of behaviour and health risk behaviour. Obesity therefore offers a useful vehicle for understanding children's health beliefs in relation to the development of self-regulatory processes and specifically the nature of children's causal reasoning and compensatory health beliefs. The purpose of causal reasoning is to understand the link between cause and effect and this develops with age and cognitive complexity (Bronson, 2000; Bibace & Walsh, 1979). Understanding children’s causal reasoning of the risks associated with specific behaviours will aid understanding of the consequences of these specific behaviours that can cause weight gain. In order to be able to engage with risk compensation (Ogden, 2012), employing one behaviour to mitigate the risks posed by another, children need to be able to generate multiple causal links and equate these in order to identify suitable substitutions (compensatory behaviours). Rabiau et al. (2006) describe this in relation to health behaviours as compensatory health beliefs thus in order to understand and inform our thinking about children’s capacity for CHBs, it is useful to understand and explore their causal reasoning regarding health risks.

Illness perceptions include aspects of causal reasoning and these have been explored in one study conducted in Australia by Babooram, Mullan & Sharpe (2011) in order to explore children’s illness representations of obesity. Utilising qualitative research methods their findings demonstrate that children aged between 7-12 years identified food intake as the main cause of obesity (Babooram, Mullan & Sharpe) reflecting the external environmental risk prevalent in many Western environments. Whilst these findings can contribute towards understanding children’s perceptions of the cause of obesity, no published research to date has explored children’s health beliefs in relation to behaviours that are associated with obesity at the underlying cognitive level.

Understanding internal cognitive processes in relation to children’s health beliefs and whether or not they have the cognitive capacity to engage in compensatory reasoning has practical and theoretical implications. From a practical perspective, this understanding can support the development of age-appropriate explanations for children (Myant & Williams, 2005) and from a theoretical perspective can inform theories regarding cognitive development (Kalish, 1996). Adult and adolescent research into compensatory reasoning has identified that CHBs are associated with unhealthy lifestyle behaviours (Radtke, Scholz, Keller & Hornung, 2012; Kronick & Knauper, 2010) and has progressed to understanding how these beliefs can inform behaviour (Kaklamanou, Armitage & Jones, 2013). However, no published research to date has explored children’s health beliefs and compensatory reasoning in relation to an unhealthy lifestyle.

* 1. **Thesis Aims**

Waumsely (2011) argues that obesity is a complex issue and if the ‘cure’ was as simple as eat healthily and exercise regularly then there would not be an obesity epidemic reducing the quality of life of individuals and utilising NHS resources. The determinants of obesity identified in the Foresight report suggest the onset of obesity is more passive than often assumed and people need to develop active strategies (within this obesogenic environment) to maintain a healthy lifestyle. Low levels of physical activity, media related activities, restricted sleep, a diet high in fat and sugar and low in fruit and vegetables have been directly associated with obesity, yet many children frequently indulge in such behaviours. The importance of adopting a healthy lifestyle and eating patterns at a young age is crucial as eating habits formed in childhood and adolescence continues into adulthood, consequently poor dietary patterns among children and adolescents have important implications for health in adulthood (Videon & Manning, 2003).

The psychological ambivalence identified in the Foresight report could be understood in terms of outcome expectancies of behaviour and motivation which relies on the ability to self-regulate one’s thoughts and behaviour. This psychological ambivalence was explored in this programme of research. This was an exploratory programme of research which sought to understand children’s internal processes in relation to health beliefs and how this might inform the development of self-regulatory processes, specifically in relation to causal and compensatory reasoning in relation to key determinants of obesity such as levels of activity, diet and sleep.

There is a plethora of research exploring obesity in the adult domain and emerging data on CHBs in adolescents and adults. Very little research had been conducted with children to explore causal reasoning of the determinants of obesity and there was no published research exploring compensatory reasoning in this population. Therefore, the aims of this programme of research are:

1. Establish children’s health beliefs in relation to the determinants of obesity at the cognitive level;
2. Assess children’s cognitive capacity to engage in compensatory reasoning;
3. Explore children’s health beliefs in relation to CHBs for behaviour associated with a healthy lifestyle;
4. Develop a scale with the ability to capture a reliable measure of the strength of compensatory reasoning.

**CHAPTER 2**

**Methodology**

This chapter will outline the methodological considerations involved in the planning of this programme of research. The epistemological position of the researcher will be explained briefly, the ethical considerations of conducting research with children, and use of qualitative and quantitative methods involved in the design of the studies involved in this programme of research will be discussed. The individual design employed for each study and the analytic techniques used are presented in each relevant chapter.

* 1. **Epistemological position**

Epistemology refers to the assumptions we make about what it is possible for us to know and how we can obtain this knowledge (King & Horrocks, 2010). It is well beyond the scope of this chapter to present a lengthy essay on philosophical issues in mixed methods research; nevertheless some discussion of them is necessary.

It is important to acknowledge theoretical positions and values in relation to research to ensure the data collection methods and subsequent analyses are appropriate. Philosophical views of knowledge are varied and directly impact on the nature of the inquiry of research (Braun & Clarke, 2006). Within essentialist or realist frameworks, the analytic approach reports experiences, meanings and the reality of participants whereas constructionist frameworks focus primarily on the ways in which realities, meanings and experiences are the effects of a range of discourses operating within society (Braun & Clarke). Critical realism is a philosophical view of knowledge that sits between the two. Critical realism acknowledges the ways individuals make meaning of their experience, and, in turn, the ways the broader social context impacts on those meanings, but also acknowledging the limits of reality (Braun & Clarke) i.e. the external world is not necessarily as it is perceived by the individual.

Given the multilevel complex systems within which obesity research and understanding sits, critical realism offers the best fit. It is possible to acquire knowledge based on children’s perception of their experience but at the same time recognise the limits of their explanation and acknowledge the wider social context which may impact on the construction of their beliefs. Critical realists argue that the choice of methods should be dictated by the nature of the research problem, and quite often the most effective approach is to use a combination of qualitative and quantitative methods as this approach can counteract the biases that are associated with single-method approaches (McEvoy & Richards, 2006). Critical realism can be used in research that takes a similar realist position to mainstream quantitative psychology, in seeking to “discover” the underlying causes of particular human phenomena (King & Horrocks, 2010). As this programme of research seeks to understand children’s beliefs, which may in turn impact on their behaviour, critical realism is an appropriate epistemological stance as it fits with mixed methods research, quantitative research involving scale development and applied research methods.

* 1. **Use of Mixed Methods Research**

The combination of both qualitative and quantitative methods is known as mixed methods research and is commonly used in health sciences (O’Cathain, Murphy & Nicholl, 2007). Mixed-methods research is recognised as the third major research approach along with quantitative and qualitative methods (Johnson, Onwuegbuzie & Turner, 2007). It is a useful approach in healthcare research as it offers the potential to obtain a deeper understanding of people and events rather than using qualitative or quantitative research methods alone (Bowling, 2009).

In its simplest terms quantitative research is empirical research where data is in the form of numbers, that is, psychological phenomena are represented by numerical outcomes to indicate specific performance ability or difference (Fraser, 2004). Questionnaires randomised controlled trials and systematic reviews are examples of quantitative approaches (McEvoy & Richards, 2006). Qualitative research is where the data is not in the form of numbers (Fraser) and includes the use of focus groups, interviews and case studies (McEvoy & Richards). Qualitative and quantitative research methods both offer different strengths. Qualitative methods excel at interpretation as it enables a researcher to understand why things are the way they are (Morgan, 1998) whereas quantitative methods do not allow for this detailed level of understanding. Quantitative research methods explain phenomena by collecting numerical data that are analysed using mathematically based methods (Aliaga & Gunderson, 2000) which can be used to generalise study findings which qualitative methods do not allow for.

It is argued that the convergence of findings stemming from two or more methods *“enhances our beliefs that the results are valid and not a methodological artifact”* (Bouchard, 1976, p. 268). O’Cathain, Murphy and Nicholl (2007) found that comprehensiveness was a key reason mixed-methods research was used in health services research, as a wider range of questions can be explored than quantitative or qualitative methods alone would allow.

O’Cathain, Murphy and Nicholl (2007) identified the differing roles of methods within a mixed methods study at each stage of the research. From the outset, qualitative methods can generate a hypothesis for a quantitative method to test, or can establish a theoretical framework. At the design stage, qualitative research can be used to complement quantitative methods. It is well established that qualitative research can help design survey instruments and aid scale development (Kruase, 2002; Bryman, 1992). Qualitative methods can explain factors underlying relationships in a quantitative study and quantitative methods can also help to generalise a qualitative study (O’Caithin et al.).

Mixed-methods research is appropriate for this programme of study as a combination of methods will enable a deeper level of understanding of children’s health beliefs. The use of qualitative research methods will provide detailed accounts of children’s beliefs and the complexities that may be apparent in children’s reasoning that may not be immediately apparent using standardised quantitative measures. This detailed understanding of children’s beliefs can allow researchers to generate hypotheses using quantitative research methods and can aid the construction of a scale to measure such beliefs and help to generalise findings from qualitative research to a wider sample of children.

* 1. **Research with Children**

Research with children and young people is crucial as it can advance our understanding of how children develop, contribute to theoretical debates, and may improve the lives of children and young people (Lewis, 2004). Fraser (2004) explains that engagement with the perspectives of research participants can enhance the claims of empirical research. Involving children in research is a relatively modern phenomenon as much research in the past was conducted *on* children rather than *with* children (Masson, 2004). The insights generated by approaches that are inclusive of children’s perspectives increase our understanding of the world (Jones, 2004). Children are important in generating knowledge (Jones) as they have views and motives that researchers cannot take for granted (Alderson, 2004). Children’s levels of reasoning and intention in relation to health behaviour cannot be assumed. Involving children in research which explores their views in relation to weight gain and compensatory reasoning will generate a deeper insight into children’s knowledge and will enhance the claims of empirical research.

In order to understand children’s interpretation of their experience many childhood studies utilise qualitative research methods but it is argued that childhood research must remain open to the widest range of techniques available to researchers in order to answer a broad range of questions (McKechnie & Hobbs, 2004). Bell (2007) discusses the importance of conducting survey research directly with children as children are able to provide reliable information about themselves with respect to a range of issues. Accordingly, this programme of research will conduct qualitative and quantitative research with children in relation to their health beliefs by conducting interviews and conducting survey research both in the development and testing of a scale designed for use with children.

* 1. **Ethics of Research with Children**

Ethical research is required when engaging anyone in research but is perhaps even more important when engaging children in the research process (Robinson & Kellet, 2004). Ethical research involves having a regard and concern for the interests and needs of participants and those individuals that the research might have an impact on (Fraser, 2004). This involves using sensitive methods for discovering views and meanings of children (Alderson, 2004).

In accordance with the British Psychological Society’s (BPS) Code of Human Research Ethics (2009) researchers must ensure that children consent freely to participation on the basis of adequate information. There are different levels of consent in relation to conducting research with children and young people. In line with BPS guidelines, gaining consent from children and young people in school involves the granting of approval and access from a senior member of school staff legally responsible for such approval in the first instance in *loco parentis*. A matter of judgement is applied to obtain parental consent for children under 16 years of age. Where parental consent is obtained this can involve opting children in or out of research participation, but generally consent in *loco parentis* from a senior member of staff in school and child assent will suffice.

Children were given the opportunity to understand the nature, purpose and anticipated outcome of their research participation using language appropriate to their cognitive development and to gain their agreement to participate. Children are unable to give informed consent due to their limited comprehension of the significance of research (Miller, 2007) and so assent was obtained from children. Assent indicates children show some form of agreement to participate without necessarily understanding the wider significance (Miller). Informed consent was obtained by schools acting in *loco parentis* with an additional consent procedure for children participating in studies three and four which involved an opting-out procedure for parents.

As the balance of power is heavily skewed towards adults in schools (Robinson & Kellet, 2004) procedures emphasising children’s right to withdraw are important ensuring children are aware that they are the experts in relation to the topic being explored and that they could stop at any time with no negative outcome or need for explanation.

Anonymity needs to be assured so that individuals are not personally identifiable. Data was appropriately anonymised by replacing children’s details with a unique identifier which comprised of a school reference made up of three letters, year group of child and participant number. Children were encouraged to avoid discussing their participation outside of the research setting in order to maintain confidentiality. Children were not deceived about the research aims and they were fully debriefed at the end of their participation outlining in further detail the specific aims of the research project.

All studies were approved by the University of Derby Research Ethics Committee.

* 1. **Introduction to data collection and data generation methods**

The qualitative research methods described in this chapter aimed to enhance understanding of children’s health beliefs in relation to risk factors associated with overweight and obesity and to explore children’s compensatory reasoning capabilities. This level of understanding cannot be achieved from quantitative research methods as information on children’s knowledge in these domains is limited.

The quantitative research methods described in this chapter aimed to develop a measurement tool in order to measure children’s beliefs, as understood from the qualitative research analyses. The resulting measurement tool was intended to aid theoretical understanding of children’s beliefs and support future research to investigate CHBs in a wider population than qualitative methods will allow.

* 1. **Draw and talk method**

Use of the draw and talk method is fairly novel in its application to health research and represents a unique contribution to this area of research. It was derived from the draw-and-write technique (Williams, Wetton & Moon, 1989) and draw- write-and talk technique (Backett & Alexander, 1991). The draw and talk technique retains the strengths of these two techniques but it also addresses some of the limitations of these approaches, each of which will be discussed in the following section.

Young children bring a wealth of information and knowledge to their learning, particularly in health education and it is important to understand the extent of children’s knowledge and understanding, otherwise health messages may be irrelevant and have little impact on children (Williams, Wetton & Moon, 1989). Williams et al. developed the draw-and-write activity during their preliminary research into the health views of primary school children. Children are asked to draw a picture and then write next to the picture what is happening (Pridmore, 1996). The draw-and-write technique is primarily a qualitative tool for understanding how children explain and construct ideas and concepts (McWhirter, Collins, Bryant, Wetton & Bishop, 2000).

The process of drawing has been shown to be a powerful means of overcoming barriers to communication and promoting dialogue and Pridmore (1996) argues that there is evidence to show that *“drawing in conjunction with writing or dialogue can be a powerful ‘bottom up’ method of exploring the health perceptions of young children”* (p.11). The writing aspect of the task is considered important as children are the best people to interpret their own drawings (Pridmore). This technique is advantageous as it is considered child-centred and non-threatening to children.

The draw-and-write technique has been used in health education research to explore a number of topics. Pion et al. (1997) measured and compared children’s perceptions of sun and skin cancer in order to develop meaningful health programmes to educate children about the ill-effects of the sun, in accordance with their knowledge base. Teachers read a series of scenarios such as *draw a family at the beach and write what a parent is doing to take care of a child.* This technique allowed for the assessment of attitudes in children regarding the sun and skin cancer, and informed the development of a health intervention increasing children’s knowledge of safety in the sun. Piko and Bak (2006) asked children to draw pictures and write a response in accordance to instructions read aloud in the classroom by a researcher, in a group setting. Children were given pre-prepared sheets of paper and asked to draw and write their lay beliefs of health, health promotion and disease prevention. The use of this method identified that children hold positive attitudes towards health and health promotion. Horstman, Aldiss, Richardson and Gibson (2008) used the draw and write method to understand 6-12 year old cancer patients views on hospital care. Their reflection of this technique identified several advantages of this technique and confirms previous observations of these advantages. Producing drawings and writing about them is an activity that many children are familiar with; therefore, it is a child-friendly and non-threatening method of collecting data with children (Bradding & Horstman, 1999). Drawings offer children an opportunity to express their fears, feelings and thoughts about sensitive issues (Hill, Laybourn, & Borland, 1996) where it might otherwise be difficult to convey this (Horstman et al.).

Children as young as four can participate in a draw and write activity, if the use of adult scribes is included to support children who may struggle to write their responses. McWhirter, Collins, Bryant, Wetton and Bishop (2000) used the draw and write method to evaluate changes in children’s perceptions of the effects of the sun on their skin. However, limitations of the draw and write technique include the potential for misinterpretation of the data collected. McWhirter et al. did not analyse the pictures due to ambiguity of the drawings, instead they analysed written statements only. Gabhainn and Kelleher (2002) used the draw and write technique in a classroom setting to obtain comparative evaluation data from schools which included health education classes with schools that did not include health education classes. They also did not attempt to interpret drawings produced beyond children’s written word in order to avoid misinterpreting the data. They identified a gender difference in the number of pictures drawn and concluded that the draw and write technique was sensitive to the different types of intervention delivered.

Other limitations of the draw and write technique include the topic that is being researched. It may be inappropriate to use the draw-and-write technique when gaining information about aspects of health care that do not lend themselves well to drawings (Bradding & Horstman, 1999). A number of researchers include interviews to accompany the draw-and-write activity in order to tap into generalised beliefs about health and illness (Backett & Alexander, 1991). This is known as the draw-write-and talk technique. In order to address the limitations of the draw and write technique, Bradding and Horstman asked children to clarify the content and meaning of their drawing to ensure they were confident they understood what the child meant to say. Bradding and Horstman explored 6 - 10 year old chronically sick children’s (predominantly with cancer) view of care. They concluded that the draw and write technique in conjunction with the open-ended task and interviewing could be used to good effect at an individual level and as an aid to the construction of audit tools.

Onyango-Ouma, Aagaard-Hansen and Jensen (2004) used the draw and write method in a classroom setting in order to identify changes in health and illness concepts resulting from a health education intervention in Kenya. Onyango-Ouma et al. accompanied this activity with one-to-one interviews, and this they argued, addressed further limitations of the draw and write method that were identified by Backett-Milburn and McKie (1999). Backett-Milburn and McKie argued that the use of drawings to explore children’s views of health and illness does not take societal and contextual considerations into account and the drawings will not produce meaningful views and feelings, instead they will reflect dominant public discourses. Onyango-Ouma et al. argue that triangulation of drawing in conjunction with writing and talking will result in weaknesses of one method being cross-checked by another method. For example, limitations in understanding of pictures can be explored further during interviews to bring to the surface social meanings, processes and practices.

The draw-write-and talk technique has been used to explore smoking attitudes and beliefs (Woods, Springett, Porcellato & Dugdill, 2005; Porcellato, Dugdill, Springett, & Sanderson, 1999) in children and is frequently used in a classroom setting. This could question the reliability and validity of responses, particularly in relation to the drawing and writing component of this technique as children may copy responses from other children (Pridmore, 1996) thus a one-to-one approach would be the most robust design to adopt when exploring children’s health and illness concepts.

Horstman, Aldiss, Richardson and Gibson (2008) argue that the draw and write technique, with or without an interview, needs to be used carefully and sensitively if children are to become active participants in revealing their world as they see it. They identified the importance of using the words of children verbatim; however, it is acknowledged that, at times, children’s verbal ability may not reflect their cognitive ability (Bryant, 1974). The draw-write-and talk technique only taps into generalised health beliefs (Backett & Alexander, 1991) and this may limit the understanding of children’s knowledge that can be derived from this method.

Piaget’s clinical method of interviewing (Piaget, 1930) can be used to elicit children’s beliefs at the cognitive level. This method requires children to provide further explanations for each of their answers using specific probes such as “Can you tell me more?” “How does [insert response] cause…?” This method of interviewing can elicit children’s underlying reasoning when children’s responses have been ‘cognitively exhausted’ i.e. their explanation is at the underlying cognitive level and no further explanation is available. Developmental researchers such as Piaget and Werner (as cited in Bibace and Walsh, 1979) argue that this method can *“achieve the goal of articulating cognitive processes.”* (p.288) and consistency within this field is necessary to ensure the same cognitive processes are being analysed.

The draw-and-talk technique retains the strengths of the draw-write-and talk technique as drawing is an activity that many children can participate in at their own level (Williams, Wetton & Moon, 1989) and it serves as an ice-breaker to an interview (Backett & Alexander, 1991). As researchers needed to clarify written text to ensure the correct meaning of children’s drawing (Bradding & Horstman, 1999) and interviews accompany this process to obtain a deeper understanding of the topic, the writing element of the activity is considered redundant as it does not add anything additional to the accompanying interview. The writing activity was removed resulting in the draw-and-talk method of data collection.

* 1. **Focus groups involving children**

Focus groups (FGs) are often used to learn about topics that are poorly understood and where there is a gap in knowledge (Morgan, 1998). The core features of FGs are that they are small, informal, and relatively homogenous (Kruegar, 1994) and aided by a moderator the goal of the group is to elicit a discussion that allows the researcher to see the world from the participant’s perspective.

FGs may be seen as facilitating the expression of individual ideas, beliefs and opinions through interaction with others (Wilkinson, Joffe & Yardley, 2004). They are group interviews guided by a moderator where typically 6-8 participants from similar backgrounds discuss the topics raised by the interviewer (Morgan, 1998). When conducting FGs with children using classes, FG participants should interact with one another in the same way that they would interact with peers outside of the research context (Willig, 2008). The role of the moderator is to introduce the focus of the group and to gently steer the discussion by reminding group members of the topic and prompting comments made by group members (Willig).

A FG schedule is developed to guide the discussion. The purpose of a FG schedule is to prepare questions and probes in order to define the context of the discussion and to induce participants’ perceptions, feelings, attitudes, and ideas about a selected topic (Heary & Hennessy, 2002). Engaging children's interest and tailoring the FG to their level of comprehension are essential for maximum participation and implies that the moderator must be familiar with the cognitive and social capacities of children, and is sensitive to children's communication abilities and attention span (Heary & Hennessy).

A review of the literature concluded that FGs were a valuable means of eliciting children’s views on health-related matters (Heary & Hennessy, 2002). Porcellato, Dughill and Springett (2002) used FGs to explore children’s perceptions of smoking and arrived at a similar conclusion that FGs are a viable method for exploring young children’s perspectives. Levine and Zimmerman (1996) argue that FGs using children have high face validity as this method acknowledges children as experts and enables the researcher to understand children’s outlook on a range of topics. Furthermore, FG research removes the element of socially desirable responses that might be elicited from one-to-one interviews, and as a result increase the validity of findings (Heary & Hennessy). Heary and Hennessy further argue that FGs can be a useful means of initial data collection for aspects of health-related behaviour that are not very well understood as they allow a researcher to further explore and probe children’s perceptions, experiences and knowledge of certain behaviours. As no previous research had explored CHBs in children, the use of FGs was considered an appropriate means to explore whether children hold CHBs or not.

* 1. **Scale Development**

Streiner and Norman (1995) identify two key reasons for a scale to be developed: the construct is a new one and no scale exists to measure it; or we are dissatisfied with the existing tools. Furr (2011) identified scale construction as a four-step process: 1) Articulate construct and context 2) Choose response format and assemble initial item pool 3) Collect data from respondents and 4) Examine psychometric properties and qualities. According to Furr, bypassing any of these steps might produce a scale with unknown psychometric quality and ambiguous meaning.

These four steps have been divided into three distinct phases of scale development: generation of an initial item pool, reliability testing and validation.

**2.8.1 Generation of an Initial Item Pool**

1. *Articulate construct and context*

The first step was to clearly determine what construct was to be measured. If the intended construct is not clearly defined and differentiated from other constructs, then subsequent steps might produce a scale with poor validity and ambiguous meaning (Furr, 2011). There are a number of considerations to guide this. DeVellis (2012) advises theory as an aid to clarity when establishing the content of the scale. Pett, Lackey and Sullivan (2003) recommend clarifying the breadth of measurement and to establish whether the instrument will measure the construct broadly or if it will focus on a specific aspect of the concept.

Researchers creating a new scale must articulate the context in which it is likely to be used as the intended population will direct subsequent steps of item writing e.g. the response formats, items, or instructions, as a scale intended to be used with adults would differ considerably from those intended to be used with children (Furr, 2011). The context includes at least two elements: the likely target population and the likely administration context (Furr).

1. *Choose response format and assemble initial item pool*

*Latent variable*

The underlying phenomena or construct that a scale intends to reflect is called the *latent variable*. That is, the construct cannot be directly observed, it is latent rather than manifest and it is variable rather than constant, and so some aspect of it might change (DeVellis, 2012). Each individual scale item that makes up a homogeneous scale could be considered a test in its own right, and a measure of the latent variable (DeVellis). These are empirical indicators of the construct which can be observed and stated as declarative statements in a designated measurement format (Furr, 2011). Guided by considerations from the first step, researchers write or seek out items that seem psychologically relevant to the intended construct. This step includes an iterative process in which items are discussed, considered in terms of conceptual relevance and linguistic clarity, and discarded or revised (Furr).

*Item generation pool*

Matsunaga (2010) advises that the initial item pool should be expansive and should include as many items as possible to avoid missing important aspects of the target construct and thereby maximising face validity. Having redundant items that appear to tap the same fact is less of a problem than missing anything related to the target construct which is a more serious concern. DeVellis (2012) suggests beginning with a pool of items that is three or four times as large as the final scale as measures of internal consistency enable items to be dropped as a result. Internal consistency reliability is a function of how strongly items correlate with one another (and hence the latent variable) – more items in the initial pool means insurance against poor internal consistency as there is more choice about which items to include or exclude (DeVellis).

Pett, Lackey and Sullivan (2003) advise a combination of methods should be used to guide item generation including the use of qualitative and quantitative methods. Qualitative group discussions prior to questionnaire construction allows for an in-depth exploration of the construct (Pett et al.). Quantitative measures include searching the available literature and examining items on current scales (DeVellis, 2012).

*Item construction*

A number of factors guide the early process of writing items. Items considered to be good are: unambiguous, not exceptionally long as length increases complexity and diminishes clarity, avoiding multiple negatives such as *“I do not like to not exercise”* and double-barrel items which convey two or more ideas as they can potentially confuse the respondent and they may not know which item they are responding to (DeVellis, 2012).

Bell (2007) offers guiding principles for the design of appropriate and effective questions for younger respondents. For question length and wording, simplicity is the key to designing good questionnaires for children so it is advisable to include short questions using unambiguous, straightforward language as children might take words literally and misunderstand the meaning of the question (Bell). Where adult questionnaires are encouraged to include an equal balance of positively and negatively worded questions, negatively worded questions should be avoided with children as such items can be problematic (Bell). Children take longer than adults to process information and some introductory text can be useful, even if it lengthens the overall scale, as an introduction can help contextualise the study for children (Borgors & Hox, 2000).

*Rating scale and number of response options*

The use of likert scales in scale development is one of the most commonly used scaling techniques in psychosocial and health care research (Pett, Lackey & Sullivan, 2003). Likert scales are composed of a number of declarative statements followed by response options that indicate the extent to which the respondent agrees or disagrees with the statement (Pett et al.). Likert scales can be used to measure opinions, beliefs, and attitudes and includes a summated rating scale of each set of items that purports to measure a specific construct that is typically summed across items to obtain a single score (Pedhauzer & Schmelkin, 1991). The response options should be structured such that there are equal intervals of agreement between them (DeVellis, 2012). Each response option should be labelled as these rating scales have been shown to produce better quality responses from children than partially labelled ones e.g. where only the two extremes are labelled (Borgers, Hox & Sikkel, 2003).

Streiner and Norman (1995) acknowledge there is no hard-and-fast rule regarding the number of options and that the decision rests with the researcher. There is a need to avoid placing excessive demands on cognition or memory, while at the same time provide children with a sufficiently refined set of response options to facilitate the easiest possible choice (Bell, 2007). A sufficient range of response options is important to ensure there is variability of responses because without it, interitem correlations will be restricted and weak (Pett, Lackey & Sullivan, 2003).

Some of the literature advises against use of a five-point likert scale. Borgers and Hox (2000) advise it is preferable to use three or four response options for children under the age of 11, and where possible to opt for yes/no questions instead due to boredom effects and to avoid children getting confused with differences between the options. Bell (2007) advises against the inclusion of a ‘don’t know’ option unless it is a valid response.

1. *Collect data from respondents*

After the construct has been articulated and the items have been assembled, the items should be administered to respondents representing the likely target population (Furr, 2011). The purpose of doing this is that it can reveal obvious problems through respondent feedback or observation e.g. respondents might require more time than initially anticipated, or they might express confusion or frustration and these issues might require revision of the scale (Furr).

Item non-response is rarely a problem in surveys of children even where there are complex or ambiguous questions (Bell, 2007). Children will respond to these questions because their limited cognitive skills preserve them from recognising that they should have a problem with these items (Fuchs, 2005). So before post-testing a questionnaire, it is important to pre-test questions. Bell outlines a cognitive pre-test that involves a ‘think aloud’ cognitive interviewing technique. This requires the respondent to articulate what he/she is thinking whilst answering the question. The child is encouraged to say what he/she thinks the question means, identify words or concepts that are unclear and explain how they arrive at the chosen response. Pretesting of questions is important as children are sensitive to the failings of questionnaire design (Bell).

*Content Validity*

Content validity is linked to the definition of the construct being examined and is concerned with item sampling adequacy i.e. the extent to which a specific set of items reflects a content domain (DeVellis, 2012). In theory, a scale has content validity when its items are a randomly chosen sub-set of the universe of appropriate items, but in the case of measuring beliefs it is not as straightforward as compiling a complete list. Maximising item appropriateness can be achieved by having items reviewed by experts for relevance to the domain of interest (DeVellis). Expert reviewers check that the items are representative of the relevant content the scale is designed to measure. These steps increase the likelihood that relevant content is included in the scale while irrelevant content is not, thus supporting claims of content validity (DeVellis).

1. *Examine psychometric properties and qualities*

Psychometric issues such as dimensionality, reliability and validity have important implications for the ability to draw meaningful conclusions from psychological research (Furr, 2011). By collecting data in a representative administration context and assessing the psychometric properties of the scale, researchers enhance the possibility that the scale will be useful and psychologically informative. Without this level of attention, scales might be psychologically ambiguous or meaningless (Furr).

* + 1. **Dimensionality**

*Definition of dimensionality*

A scale’s dimensionality refers to the number and nature of the psychological variables or dimensions reflected in its items (Furr, 2011). A scale’s items might be unidimensional, all reflecting a single common psychological variable (e.g. general compensatory reasoning), or they might be multidimensional, reflecting two or more psychological variables. If a scale is multidimensional and a robust correlation exists between dimensions, this suggests that the dimensions, though separable, share a deeper common psychological variable; and the psychological meaning of the dimensions must be identified (Furr).

*Aim of factor analysis*

Factor analysis (FA) is not a single statistical method (Pett, Lackey & Sullivan, 2003). It represents an array of procedures used to identify the interrelationships among a large set of observed variables and then, through data reduction, to group a smaller set of these variables into dimensions or *factors* that have common characteristics (Nunnally & Bernstein, 1994).

A factor is a linear combination or cluster of related observed variables that represents a specific underlying dimension of a construct, which is as distinct as possible from the other factors included in the solution (Tabachnick & Fidell, 2007). A “factor” is a construct operationally defined by its factor loadings (Royce, 1963 as cited in Kline, 1994). “Factor loadings” are the correlations of a variable with a factor (Kline).

FA is used as a data reduction technique, it is not designed to test hypotheses or assess whether one group is significantly different from another (Pallant, 2007). FA takes a large set of variables and looks for a way the data may be ‘reduced’ or summarised using a smaller set of factors or components. It does this by looking for groups among the intercorrelations of a set of variables (Pallant).

*Different types of FA*

There are two main approaches to using factor analysis: exploratory and confirmatory (Pallant, 2007). Exploratory factor analysis (EFA) is often used in the early stages of research to gather information and explore the interrelationships among a set of variables. EFA is a tool intended to help generate a new theory by exploring latent factors that best accounts for the variations and interrelationships of the manifest variables (Henson & Roberts, 2006).

Confirmatory factor analysis (CFA) is a more complex and sophisticated set of techniques used later in the research process to test, or confirm, specific hypotheses or theories concerning the structure underlying a set of variables (Pallant, 2007). It is used to test an existing theory and hypothesizes an a priori model of the underlying structure of the target construct and examines if this model fits the data adequately (Bandalos, 1996).

Key steps when conducting a FA includes: assessing the suitability of data for FA, factor extraction, factor rotation and interpretation (Pallant, 2007).

*Assessing the suitability of data for FA*

During the exploratory phase of FA, it is important to determine if there are sufficient numbers of significant correlations among the items to justify undertaking a FA. The *Bartlett’s test of sphericity* tests the null hypothesis that the correlation matrix is an identity matrix (i.e. that there is no relationship among the items). Larger values of Bartlett’s test indicate greater likelihood that the correlation matrix is not an identity matrix and that the null hypothesis will be rejected. The *Kaiser-Meyer-Olkin Test* (KMO) is a measure of sampling adequacy that compares the magnitudes of the calculated correlation coefficients to the magnitudes of the partial correlation coefficients. Evaluating the size of the KMO based on the following criteria indicate above .9 is marvellous, .8 is meritorious, .7 is just middling and less than .6 is unacceptable (Kaiser, 1974, p.35). In addition to the overall KMO, a *measure of sampling adequacy* (MSA) was computed for each individual item using only the simple and partial correlation coefficients involving the particular item under consideration. The MSA for an individual item indicates how strongly that item is correlated with other items in the matrix. The same interpretation for standards of excellence outlined for KMO can be applied to individual MSAs, that is, ideally individual MSAs that are greater than .7 are sought. If these items are below .6 then the item needs to be deleted, tests rerun with a further inspection of the matrices until KMO and MSAs are at an acceptable value (Pett, Lackey & Sullivan, 2003).

In order to determine whether the matrix is factorable, the correlation matrix will be examined to identify items that are either too highly correlated (*r* ≥ .8) or not correlated sufficiently (*r* < .3) with one another (Pett, Lackey & Sullivan, 2003). If items are too highly correlated there may be a problem with multicollinearity and one of the highly correlated items will need to be removed. If the items are not correlated strongly enough, there will not be much shared common variance, thus potentially obtaining as many factors as items (Pett et al.).

Once the correlation matrix has been examined and is deemed to be factorable, the next step is to condense the variance that is shared among these items (Pett, Lackey & Sullivan, 2003) to determine the number of factors that appear to represent the construct that will be measured.

The factor analytic process involves two stages: 1) identify the number of initial factors and 2) rotating the factors to improve interpretation.

*Extraction methods*

The key difference in extraction methods is largely to do with how variance is dealt with. *Common variance* is the amount of variance that is shared among a set of items that can be explained by a set of common factors (Kline, 1994). Items that are highly correlated with one another will share a great deal of variance among themselves, and therefore a common set of factors that summarise the set of interrelationships among the variables can easily be identified (Pett, Lackey & Sullivan, 2003). *Specific variance* is variance that is specific to a particular variable that is not shared with other items or shares variance with items that are not included in the current analysis (Pett et al.). *Error variance* represents error of measurement. Its impact on items can be evaluated by examining the items internal consistency or *reliability* using the coefficient α – the more reliable the set of items, the lower are their errors of measurement (Kline). The variance that items share in common is important in factor analysis as factor extraction methods differ in their approaches to addressing the problem of what to do with specific and error variance in the factor analysis solution. The two sources of variance in combination (specific and error variance) have been described as *unique* variance (Kline).

In principal components analysis (PCA), all the variance in the data is analysed, both shared and unique. This assumes there is no error. PCA transforms the original variables into smaller sets of uncorrelated components. Alternative factor analysis methods estimate factors using a mathematical model, where only the shared variance is analysed using principal factor analysis or maximum likelihood estimate (Pallant, 2007). Only the shared variance is analysed, unique variance is excluded, and some error variance is assumed (Dancy & Reidy, 2004).

It has been argued that all of the methods of condensation give similar results (Costello & Osborne, 2005). Principal factor analysis (PAF) is considered an adequate method, maximum likelihood factor analysis is also a good technique for initial condensation, and principal components analysis gives results closely similar to both principal factors and maximum likelihood methods. Tabachnick and Fidell (2007) in their review of PCA and FA conclude *‘If you are interested in a theoretical solution uncontaminated by unique and error variability…FA is your choice. If on the other hand you simply want an empirical summary of the data set, PCA is the better choice’* (p.635).

Nunnally and Bernstein (1994) argue that a PAF solution that contains the same number of factors as PCA will provide a better estimate of the correlations because PCA solutions include errors of measurement and PAF can offer a superior solution to PCA.

*Rotation methods*

Once the factor analysis has been completed, factors then have to be rotated before they can be interpreted. The goal of rotation is to simplify and clarify the data structure. Rotation *cannot* improve basic aspects of analysis such as the amount of variance extracted from the items (Costello & Osborne, 2005). As with extraction, there are a variety of choices.

There are two different classes of rotation, *orthogonal* and *oblique,* both aim to simplify the factor structure. An orthogonal rotation assumes that factors are independent of each other (that is, they are uncorrelated) whereas an oblique rotation assumes factors are not independent of one another, rather, there is some correlation among two or more factors being rotated (Pett, Lackey & Sullivan, 2003). The assumption of orthogonal rotations that factors, or subscales, are uncorrelated with one another is rarely met in healthcare research (Pett et al.). In health sciences it is reasonable to assume that factors might be correlated. Since behaviour is rarely partitioned into units that function independently of one another, the use of orthogonal rotations can result in loss of valuable information if the factors are correlated, and oblique rotation should theoretically render a more accurate solution (Costello & Osborne, 2005).

‘Promax’ is a rotation method that provides solutions with correlated factors and ‘Varimax’ rotation method classifies items into components which are uncorrelated (Matsunaga, 2010). Matsunaga argues that even if the factors are uncorrelated, such patterns should emerge naturally out of the promax rotation.

*Selecting the number of factors to retain*

The goal of factor analysis is to reduce the number of factors that appear to represent the construct being measured such that we maximise the amount of variance explained with the fewest number of factors (Fabrigar, Wegener, MacCallum, & Strahan, 1999). However, it has been recognised that *“There is no consensus on the appropriate criteria to use”* for factor retention (Hayton, Allen & Scarpello, 2004, p. 192) and there are a number of rules/criteria available from the literature to help determine the number of factors to retain.

This includes selecting factors for which the eigenvalues are greater than 1.00. Eigenvalues show the proportion of variance accounted for by each factor (Dancy & Reidy, 2004). Comrey and Lee (1992) caution the use of this criterion in isolation as the researcher may over- or underestimate the correct number of factors. It is known to overestimate the number of latent factors and so other factor retention strategies should be used including the scree test (Cattell, 1966). This includes plotting the extracted factors against their eigenvalues in descending order of magnitude to identify distinct breaks in the slope of the plot (Pett, Lackey & Sullivan, 2003). Cattell (1966) offered this method of identifying distinct breaks between the steep slope of the larger eigenvalues and the trailing off of smaller ones to guide retention of the number of factors that appear prior to the trailing off or break occurs.

*Evaluating and refining the factors*

Having extracted and rotated factors, the remaining pool should contain items that tap theoretically meaningful and interpretable factors and not those that reflect insubstantial noises or measurement errors (Kline, 1994).

A factor loading is the correlation between the item and the factor (Foster, Barkus & Yavorsky, 2006). The meaning and interpretation of factors is derived from their loadings (Kline, 1994). According to Kline, factor loadings are high if they are greater than 0.6 (positive and negative signs are irrelevant) and moderately high if they are above 0.3. Other loadings can be ignored. Tabachnick and Fidell (2007) cite .32 as a good rule of thumb for the minimum loading of an item, which equates to approximately 10% overlapping variance with the other items in that factor. A factor with fewer than three items is considered weak and unstable; 5 or more strongly loading items (.5 or better) are desirable and indicate a solid factor.

When using an oblique rotation, it is common to have items with strong loadings on multiple factors, as an oblique rotation assumes factors are correlated; when deciding which factor these items should be placed with, the decision should be based on conceptual relevance and so the item should be placed on the factor that it is most closely related to conceptually (Pett, Lackey & Sullivan, 2003).

Naming factors is a subjective process and interpreting the meaning of a factor from the items loading on it is a form of face validity (Kline, 1994). It is important to identify a factor other than by its loadings hence the need to validate factors against external criteria (Kline) such as other psychological constructs or behaviour.

Dancy and Reidy (2004) conclude that there are many options in FA but the researcher should follow the one that makes sense not only statistically but also theoretically.

* + 1. **Reliability Testing**

*Definition of reliability*

The aim of computing reliability is to estimate the variable’s true score and determine what proportion of the obtained scale score that true score represents (DeVellis, 2012).

Any measurement involves some error and so any test result has two components: a ‘true’ score and error, each being independent of the other i.e. the true score and the error values are uncorrelated (Coaley, 2009). The true score can never be fully ascertained due to random error but what can be calculated is the observed score. The observed score is an estimate of the true score and the relationship between the three components can be expressed by the equation:

Observed score = true score + error or X = T + E

The true score (T) can be obtained by taking the mean score that a person would get if they completed it an infinite number of times. In reality this would never happen and so the true score is regarded as a hypothetical construct. The principal concern is to deal effectively with the random error (E). The less random error when using the measure, the more the observed score (X) reflects the true score (Coaley, 2009).

*"The reliability of any set of measurements is logically defined as the proportion of their variance that is true variance... We think of the total variance of a set of measures as being made up of two sources of variance: true variance and error variance... The true measure is assumed to be the genuine value of whatever is being measured... The error components occur independently and at random”* (Guilford 1965, p.439-40 as cited in DeVellis, 2012).

A reliable measure is one that performs in consistent, predictable ways (DeVellis, 2012). In practical terms, the score produced by a scale should not change unless there has been an actual change in the construct that is being measured and so a reliable measure of children’s CHBs would ensure that any changes in the observed score of a scale is attributed to changes in children’s compensatory reasoning and not resulting from an unreliable measure. As DeVellis states *“A perfectly reliable scale would be a reflection of the true score and nothing else.” (p.31).*

The concept of reliability is linked with repeatability or reproducibility of an assessment. For any measure to be useful, it needs to have consistency so that it produces more or less the same result for a person each time it is used (Coaley, 2009). High reliability means that a measure gives similar results on different occasions, but no measure is completely accurate and there is always some degree of error. Therefore, high reliability means low error and low reliability means enormous amounts of error (Coaley).

If items of a scale have a strong relationship to their latent variable, they will have a strong relationship with each other as they share a common cause and are measuring the same thing (DeVellis, 2012). As a consequence of each of the indicators correlating with the latent variable, they should also correlate with each other (DeVellis).

There are a number of different measures of reliability. The following sections will discuss the use of internal consistency, temporal stability and additional reliability measures based on the function of individual items in relation to the entire scale.

*Measures of reliability: Internal Consistency*

Internal consistency reliability is concerned with the homogeneity of the items within a scale (DeVellis, 2012). According to DeVellis *“A scale is internally consistent to the extent that its items are highly intercorrelated.”* (p.34). The correlations among items are likely to be caused due to the fact that the items share a common cause and are measuring the same construct. Strong correlations among items imply strong links between items and the latent variable, thus a unidimensional scale or single dimension of a multidimensional scale should consist of a set of items that correlate well with one another (DeVellis).

Internal consistency is typically equated with Cronbach’s (1951) coefficient alpha (α). Alpha is an indication of the proportion of variance in the scale scores that is attributable to the true score (DeVellis, 2012). All of the variation in items that is due to the latent variable is considered *shared* or *common* and so the items vary jointly as they are correlated with one another, whereas, error terms are the source of *unique* variation and the value of a given error term affects the score of only one item, which means error terms are not correlated with one another (DeVellis).

Measures of internal consistency are based on a single administration of the measure and represent the average of the correlations among all items in the measure (Streiner & Norman, 1995). If the measure has a relatively large number of items addressing the same underlying dimension, then it is reasonable to expect that scores on each item would be correlated with scores on all other items. There are a number of ways to calculate these correlations, called *Cronbach’s alpha, Kuder-Richardson,* or *split halves*, but all yield similar results (Streiner & Norman).

As internal consistency reliability is concerned with the homogeneity of the items within a scale, Cronbach’s alpha will be computed to assess the strength of correlations among items, where strong correlations imply a strong link between the items and the latent variable. According to Streiner and Norman (1995) standards of acceptable reliability include that internal consistency should exceed 0.8, and it might be reasonable to demand stability measures greater than 0.5. According to Furr (2011), reliability is low if it is below 0.7 or 0.8.

*Measures of reliability: Temporal Stability*

Measures of internal consistency involve only a single administration of the test but they do not take into account variation from day to day (Streiner & Norman, 1995) nor do they account for measurement error affecting responses such as fatigue which might affect a participant’s responses to all items during one measurement occasion, but might not affect his or her response on another measurement occasion (Furr, 2011). This might result in underestimating the totality of error affecting scale scores, thereby overestimating reliability (Furr). Error with children on a single administration of a scale could also include guessing responses to item, boredom effects resulting in scoring a patterned response, and so giving the same scale to the same children on two different occasions can assess the scale’s reliability over time (Furr). This measures how constant scores remain from one occasion to another (DeVellis, 2012) and test-retest reliability is the method typically used to assess this. Scores from the first occasion could be correlated with those from the second occasion. The rationale for this reliability measure is that if a measure truly reflects a meaningful construct, it should assess that construct comparably on separate occasions (DeVellis).

A number of assumptions underpin the test-retest approach. This includes the assumption that there are no changes in the true score differences among participants; and error variance of the first occasion is equal to error variance of the second. If these assumptions are valid, then the correlation between scores from the two measurement occasions is an estimate of reliability (Furr, 2011).

Expert opinions regarding the appropriate test-retest interval varies from one hour to a year depending on the task (Streiner & Norman, 1995). A retest interval of two days to 14 days (Streiner & Norman) or intervals of two to eight weeks is common (Furr, 2011). An appropriate time interval for children must factor in the developmental period during which the test-retest interval occurs. Psychological change/instability may be more likely during some periods in an individual’s life (e.g. early childhood) than in others (Streiner & Norman). A retest period that is too long could result in cognitive-developmental changes and result in a change in the construct, which could be indicative of changes to test scores and incorrectly suggest the scale is not a reliable measure over time. A retest period that is too short could mean children remember their responses.

*Additional reliability measures*

Additional reliability measures include examining individual items. An important statistical aspect of an item’s quality is its variability (Furr, 2011). Items with restricted range, such as very high or very low scores (ceiling and floor effects), are candidates for exclusion as they are unlikely to correlate well with other items. Excluding such items can improve inter-item correlations (Furr).

Additional uses of coefficient alpha include item selection and description based on individual checks to see whether alpha reduces in value indicating the item is important for the scale, or whether alpha increases, increasing the reliability suggesting the item should be retained (Nunnally, 1978).

Another way to improve inter-item correlations and thus improve reliability is to assess an item’s association with the other items in its scale. An item with a weak association with other items is a candidate for revision or exclusion. This can be examined by looking at the item’s correlations with other items (Furr, 2011). A second useful piece of information is an item’s item-total correlation, or corrected item-total correlation. A corrected score excludes the response item that is being evaluated, to ensure the corrected total does not have a spuriously higher relationship with the item (Furr). A benefit of more reliable scales is that they increase statistical power for a given sample size, or they allow a smaller sample size to yield equivalent power, relative to less reliable measures (DeVellis, 2012).

* + 1. **Validity**

*“Psychology focuses upon assessment of concepts which are based on inference, and this lies at the heart of what we mean by validity.”* (Coaley, 2009, p.14).

Validity is the extent to which a test measures what it claims to be measuring, and the extent to which it is possible to make appropriate inferences from the test score (British Psychological Society’s Steering Committee on Test Standards as cited in Coaley, 2009). Dimensionality and reliability are important aspects of a scale’s psychometric properties and quality but validity is the most crucial facet; even if dimensionality and reliability of scale scores are robust, poor validity compromises a scale’s psychological utility (Furr, 2011).

Validating a scale is a process which enables researchers to determine the degree of confidence that can be placed on inferences made about people based on their scores from that scale (Norman & Streiner, 1995). There are different types of validity. Content validity has already been discussed earlier in this chapter; the following section will outline construct validity in more detail.

Construct validity is directly concerned with the theoretical relationship of a variable to other variables. It is the extent to which a measure “behaves” the way that the construct it purports to measure should behave with regard to established measures of other constructs (DeVellis, 2012). Its relationships with other variables can be either positive or negative, and this can be understood in terms of convergent and divergent validity.

Convergent validity is evidence of similarity between measures of theoretically related constructs. It assesses how closely a new scale is related to other variables and other measures of the construct to which it should be related. If scores do not correlate on other measures, then the problem can be either the newly developed scale, the other scale used, or the theory (Norman & Streiner, 1995). Also, scales should not be too highly correlated as this would indicate they are measuring the same thing (Norman & Streiner) which questions the utility of the newly developed scale. Not only should the construct correlate with related variables, it should not correlate with dissimilar, unrelated ones and this is referred to as discriminant or divergent validity (Norman & Streiner).

* 1. **Summary**

This mixed-methods approach was used to achieve the aims of this programme of research.

The draw and talk qualitative research method was used to explore children’s understanding of overweight and obesity, when primed for body size, at the cognitive level in terms of its definition, prevention and cause; this research method was also used to assess children’s cognitive capacity to engage in compensatory reasoning. Focus groups were used to explore children’s health beliefs specifically in relation to CHBs for behaviour associated with a healthy lifestyle. Quantitative research methods were used to develop a scale measuring children’s CHBs.

**CHAPTER 3**

**Draw and Talk Study**

**3.1 Introduction**

Children’s concepts of health are relatively under-investigated. It is important to understand children’s thinking about health as it is easier to establish positive health attitudes at a young age than to change negative attitudes later in life (Piko & Bak, 2006). Previous research exploring children’s concepts of the meaning of health has identified children’s understanding of health to include the ability to perform daily activities, being happy, being active and experiencing lack of pain, which demonstrates children have a multidimensional concept of health including well-being and the absence of disease (Onyango-Ouma, Aagaard-Hansen & Jensen, 2004). Onyango-Ouma et al. delivered an action-oriented health education intervention in Kenya and found that children’s causal reasoning of health concepts changed from an external locus of control, perceiving health as a result of external forces beyond their control to an internal locus of control post-intervention where children believed they could take personal action to maintain and improve their health.

An accurate understanding of children’s beliefs and knowledge about health-related issues is necessary (Piko & Bak, 2006). This information could support the development of health education programmes to build on preadolescent children’s negative attitudes towards health risk behaviour (Porcellato, Dughill & Springett, 1999), such as sedentary behaviour or consumption of a high-sugar and high-fat diet, which can increase the risk of obesity (Foresight, 2007). Assessing children’s concepts of health, however, can present a challenge due to their cognitive abilities (Piko & Bak, 2006). A number of academic approaches to understanding the development of children’s conceptions of health have been proposed including a stage-based Piagetian approach or alternative functionalist theories which emphasise the role of experience.

Adopting a Piagetian approach to cognitive development suggests impulsive processes result in modifications to and reorganisation of abstract constructs based on four general stages of cognitive development. The first stage is the ‘sensorimotor stage’ during which children from birth - 2 years of age gain knowledge about the world through their innate reflexes and develop object permanence, that is, they are able to mentally represent objects that are out of sight. Children aged 2 - 7 years are then at the ‘preoperational stage’ where they develop language, can play imaginatively but are egocentric in that they are unable to take the point of view of another person. In the ‘concrete-operational stage’ (ages 7 - 12) a child relies on logic to solve problems. They are no longer egocentric and have more flexible thought processes as they can now reverse thoughts, however, they still require concrete objects to demonstrate such reasoning. The final stage of cognitive development is the ‘formal-operational stage’ (12 years onwards) where children are able to think abstractly and use logic to solve problems (Piaget & Inhelder, 1969). From a Piagetian perspective, development of thinking is automatically regulated by the equilibrium process of assimilation and accommodation, which allows information from the environment to enter and change existing cognitive structures as the child interacts with objects and people in his or her environment (Bronson, 2000).

Bibace and Walsh (1979) recognised that Piaget’s theory was too general to apply to particular content areas and so they developed a cognitive developmental framework that can be used in relation to specific areas such as health and illness. This cognitive-developmental framework includes two subcategories within the Piagetian stages of preoperational, concrete operational and formal operational thought.

Within Piaget’s preoperational stage Bibace and Walsh identify ‘phenomenism’ and ‘contagion’ as characteristic of explanations in children aged between 2-7 years. The child is egocentric and unable to differentiate between self and world and holds irreversible thoughts. Within the category ‘phenomenism’ illness is defined in terms of a single external symptom (usually sensory) that the child has associated with the illness e.g. ‘a heart attack is from the sun’ (p.291) and the cause of the illness is often inappropriate and spatially remote. Whilst the child focuses on a concrete, single aspect of his/her own experience to define an illness, he/she does not make a clear causal link between the source of illness and the illness itself. An explanation of illness consistent with ‘contagion’ involves defining illness in terms of a single, external symptom that is spatially closer to the person, increasing sophistication can be seen in the belief that temporal or spatial proximity is necessary between the illness and source e.g. ‘How do people get colds?’ ‘Other kids’ (p.292) but offer no further explanation.

Within Piaget’s concrete-operational stage Bibace and Walsh identify ‘contamination’ and ‘internalization’ stages, typical of children aged between 7-11 years. At the concrete-operational stage a child can distinguish between what is external and internal to the self but primarily focuses on external real events and is unable to accommodate hypothetical events. A child at this stage is less egocentric, can conceptualise the reversal of processes and can specify relationships between events.

Children at the contamination stage cannot differentiate mind and body and so immoral behaviour, usually described in terms of bad behaviour in children, is ‘functionally equivalent’ to contact with dirt or germs as a cause of illness. The source of illness continues to be external but the child can make a clear causal link between the source and its effect on the body. The child identifies multiple symptoms instead of a single external symptom and begins to differentiate between self and world by differentiating between the source of illness and causal links to the body. ‘People get measles from someone else who has them, you get bumps on your arm…by rubbing up against them’ (p.293).

Explanations of illness at the ‘internalization’ stage are described within the body. Children define illness in terms of internal body parts but cannot explain the physiology of the internal organs and instead use concrete analogies to describe the internal processes. The child describes visible events such as swallowing or inhaling and reversibility of thought is apparent at this stage as children realise that a person that is unwell can become better. Key features of thought processes in the concrete-operations stage are that children have the ability to make causal links between external sources and the impact this has on the body and flexibility of thought processes are possible. In the internalization stage children can engage in behaviours to both avoid illness (risk) and engage in behaviours to maintain health.

At the formal-operational stage, children aged 11-15 years are able to include possibility in their thought processes and there is a large amount of differentiation between the self and the world. The sub-categories at this stage are ‘physiological’ and ‘psychophysiological’. Children at the physiological stage understand that whilst the cause of illness was triggered by an external event, it is described and explained in terms of internal body organs and functions and can refer to invisible functions that cause malfunctioning e.g. ‘Cancer is when there’s too many cells. They’re invisible but I know that they grow’ (p.295). Psychophysiological explanations of illness are described in terms of internal physiological processes but the child now perceives an additional cause of illness which is psychological. “The child becomes aware that a person’s thoughts or feelings can affect the way the body functions.” (p.296) For example ‘a heart attack is from being all nerve racked and weary’.

Bibace and Walsh argue that at the ‘internalization’ stage children identify that they can engage in behaviours to maintain health whereas at the stages before this the child believes they can simply avoid illnesses. There has been lots of research adopting a Piagetian framework across different topics including concepts of nutrition, health and illness which lend support to this developmental framework (Burbach & Peterson, 1986; McQuaid, Howard, Kopel, Rosenblum & Bibace, 2002; Brouse & Chow, 2009).

There are however a number of criticisms of this approach. It has been suggested that a Piagetian approach underestimates children’s understanding of illness (Myant & Williams, 2005). Other approaches to cognitive-development assume developmental changes occur as a result of bi-directional relations between the child and the environment (Avan & Kirkwood, 2010). Eiser (1989) questions the validity of stage theories and argues for use of alternative theories which emphasise the role of experience. Vygotsky argued that children’s cognitive-development occurs as a result of interaction with the environment as children reconcile currently held concepts to a new, different, or conflicting one encountered in social interaction (Vygotsky, 1978). Vygotsky’s theory of development suggests that children’s development is shaped by their social environment and that significant others help them to understand their surroundings by offering ‘scaffolding’ to simplify it (Dovey, 2010). Support for theories which emphasize the role of experience can be seen in previous research. Charman and Chandiramani (1995) compared children’s understanding of physical illness and found that 5-, 7- and 9-year-olds all had a basic knowledge of chicken pox and depression. They found that older children’s more sophisticated understanding reflected greater experience of both types of illness.

Theoretical debates on the process of cognitive-development will remain (Lerner, Lewin-Bizan & Warren, 2011). Different scientists can look at the same dataset and disagree about whether development has occurred due to the existence of different conceptual templates and theoretical beliefs (Lerner et al.). Despite such differences, what is common to nearly all the literature, regardless of its theoretical underpinning, is that children’s understanding of health and illness tends to progress the older they get (Carter & Simons, 2014).

Research exploring children’s views of obesity is minimal. The behavioural determinants of obesity are explored based on understanding children’s beliefs and behaviour in relation to levels of activity and fruit and vegetable consumption based on parental beliefs (Pearson, Biddle & Gorely, 2009; Dellert & Johnson, 2014) or by obtaining children’s views in relation to specific health domains such as nutrition (Brouse & Chow, 2009) and perceptions of fruit and vegetable consumption (Zeinstra, Koelen, Kok & de Graaf, 2007). There is minimal research exploring children’s views of obesity with only one identified study exploring children’s conceptions of obesity using Leventhal, Meyer and Nerenz’s (1980) common-sense model of illness representation which focuses on the identity, cause, timeline, consequence and control/cure of illness (Babooram, Mullan & Sharpe, 2011). Babooram et al. qualitatively examined 7 -12 year old children’s views of obesity as defined by Leventhal et al.’s model. Children were asked to draw a picture of themselves and a picture of an overweight or obese person and to explain the difference between the two pictures along with words they would use to talk about someone who is obese in order to understand how they identify obesity. They found that children identified a large stomach and large limbs as a prominent feature of obesity, children identified food intake as a main cause of obesity with almost half of children not identifying sedentary behaviours as a cause of obesity. Duration (timeline) of obesity was dependent on undertaking positive health behaviours. Babooram et al. found that pictures of obese figures contained negative features such as having no smile when compared to the child’s self-drawing. Normal weight children were found to list more severe consequences of obesity than the overweight group and they found that experience contributed to the detailed knowledge of overweight children’s perceptions of cures of obesity. Identifying cures of obesity differs from compensatory reasoning as cures relate to long-term management of behaviour and compensatory reasoning involves immediate, in the moment justifications, which involves identifying one individual behaviour negating the negative effects of another individual behaviour.

In the UK, obesity itself is not classified as an illness. Exploring children’s understanding of health behaviour in relation to a visible risk factor such as obesity, rather than in relation to a specific illness offers the opportunity to understand children’s causal reasoning across a variety of domains and the emergence of self-regulatory processes; specifically compensatory health beliefs (CHBs). Understanding children’s causal reasoning of the risks associated with specific behaviours will aid understanding of the consequences of these specific behaviours that can cause weight gain. In order to be able to engage with risk compensation (Ogden, 2012), employing one behaviour to mitigate the risks posed by another, children need to be able to generate multiple causal links and equate these in order to identify suitable substitutions (compensatory behaviours).

Understanding CHBs is important as the adult reasoning literature exploring CHBs in relation to a healthy lifestyle associated the tendency to hold CHBs with poorer health outcomes (Rabiau, Knauper & Miquelon, 2006). It cannot be assumed that children hold CHBs due to the qualitative differences between adult and children’s reasoning. Compensatory reasoning involves the development of specific health beliefs with a clear link to the process of internalization, reversibility and the flexibility of thought and the concrete-operational stage offers a clear time frame in which to examine the development of such beliefs. Thus, in order to understand and inform our thinking about children’s capacity for CHBs, it is useful to understand and explore their causal reasoning regarding health risks. No published research, to date, has explored compensatory reasoning in children and the first step involved in this is to establish whether or not children hold the cognitive capacity to engage in compensatory reasoning.

From a public health perspective, knowing what the modifiable factors are, such as use of specific health beliefs, is useful information when developing obesity prevention interventions. If children of similar ages adopt similar levels of reasoning in relation to the risk factors and determinants of obesity, health professionals can develop preventive strategies supporting children to engage in health protective behaviours using terms and concepts that are not beyond their cognitive capabilities.

The aim of this study was to explore children’s causal reasoning in relation to an increased body weight and size which is indicative of overweight and obesity, in terms of how it is defined, prevented and caused. Children’s cognitive capacity to engage in compensatory reasoning in relation to causal factors of overweight and obesity was also explored. This study did not aim to confirm or disconfirm cognitive-developmental theories. Children’s understanding of overweight and obesity in relation to associated risk factors of a large body size was explored with an awareness of the range of theoretical explanations available to understand these beliefs.

**3.2 Methodology**

*3.2.1 Design*

A qualitative design using the draw and talk method was utilised to elicit children’s understanding of obesity. This involved priming children with silhouettes, asking them to draw three pictures and conducting one-to-one interviews using Piaget’s clinical interviewing technique.

*3.2.1.1 Priming task*

Prior to carrying out the draw and talk activity, children were primed to think about overweight and obesity in terms of being ‘unfit’ or ‘unhealthy’. This is because overweight and obesity are abstract concepts that many children are unfamiliar with, particularly as overweight and obesity in schools is discussed using terms such as ‘unfit’ and ‘unhealthy’ (personal communication with primary school teachers). Also, obesity is a medically defined term based on precise calculations to produce a BMI score.

As children’s conceptualisations of being unfit and unhealthy are wide-ranging and can encompass a number of (causal) factors or ‘behavioural pathogens’ some of which are not immediately relevant to the study of obesity in this population e.g. smoking, children were primed to think about unfit and unhealthiness in relation to overweight and obesity by being presented with a selection of figure silhouettes developed by Stunkard, Sorensen and Schulsinger (1983) (see Appendix A). Presenting body size as a general health risk in relation to overweight and obesity should provide an opportunity to explore children’s understanding of risk factors related to weight gain. Stunkard et al.’s Figure Rating Scale includes eight figure silhouettes that are based on BMI calculations for both males and females. This scale is used in research to measure body dissatisfaction (Huddy, Johnson, Stone, Proulx & Pierce, 1997; Krane, Stiles-Shipley, Waldron & Michalenok, 2001). The use of such silhouettes is advantageous as they are more visual and less abstract making them a reliable and easy to use measure with children when engaging them with consideration of body size (Truby & Paxton, 2002).

As the current study did not aim to measure body dissatisfaction in children, only three of the figure silhouettes per gender were retained for use in this priming study. Male children were presented with male figure silhouettes and female children were presented with female figure silhouettes. Each child was presented with three silhouette structures: very thin, ‘normal’, and overweight. A very thin silhouette structure was included as some children might identify an underweight silhouette as the healthiest, which also has implications for health promotion strategies, for example, to ensure the prevention of obesity does not encourage an underweight unhealthy population which has its own health risk factors. Each child was asked which of the silhouette structures they consider to be the healthiest and unhealthiest and to explain the reasons for their choices. Children were not asked to consider their own silhouette to avoid personalising the task and focus on their body image; rather, they were asked to consider healthy and unhealthy in relation to the silhouettes. The body size priming task was used to focus the children on considering healthy and unhealthy in relation to obesity health risks without specifically naming overweight or obesity given that these are abstract labels.

*3.2.1.2 Draw and talk activity*

Following on from the priming task, children then took part in the draw and talk activity. Children were asked to draw a series of pictures of an unhealthy or unfit person and using Piaget’s (1930) ‘clinical method’ of interviewing, were asked to explain their pictures in detail. Standard probes were utilised for each question such as *“what else?” “tell me more about that” “explain how”* until the researcher was satisfied that the child’s understanding was exhausted. Any leads the child offered were followed and the meaning of all terms used by the child were questioned in order to achieve explanations of obesity at the cognitive level.

*3.2.2 Participants*

Participants were recruited from two primary schools in the Midlands region of the United Kingdom. Twenty-four children from Years 1 and 2 and 24 children from Years 4 and 5 participated from two different schools (N=48).

School 1 was a small, rural community primary school for children in the age range 4-11years. It was a mixed gender school with approximately 80 pupils. According to the school Ofsted report, the proportion of pupils known to be eligible for free school meals is well below average and most of the pupils are of White British heritage. According to the Office for National Statistics 2011 census data, using the Index of Total Deprivation 2010 the neighbourhood this school was located in had an Index of Total Deprivation rank 24902 out of 32482, with 1 ranked at the most deprived neighbourhood in England. The domains used in the Index of Total Deprivation 2010 include income, employment, health, education, crime, access to services and living environment (Department for Communities and Local Government, 2011). All the small areas in England can be ranked according to their Index of Deprivation score; this allows users to identify the most and least deprived areas in England and to compare whether one area is more deprived than another. The index of deprivation is a relative not an absolute measure of deprivation with one area having a higher deprivation score than another if the proportion of people living there who are classed as deprived is higher.

School 2 was an urban primary school. According to the school Ofsted report this is a community primary school with approximately 200 children in the age range 4-11years. Most pupils are from White British backgrounds and the proportion of pupils eligible for free school meals is well below average. According to the Office for National Statistics 2011 census data, using the Index of Total Deprivation 2010 the neighbourhood this school was located in had an Index of Total Deprivation rank of 22362.

The inclusion criterion for this study was: children were aged between 5-11 years and had conversational skills in English language in order to participate in the study. The exclusion criteria was: children who do not have conversational English language skills or children that may struggle to draw pictures if, for example, they have problems with their motor skills, but additional advice was sought from teaching staff to identify children that were unable to participate due to such difficulties.

There were 28 female (13 in KS1 and 15 in KS2) and 20 male (11 in KS1 and 9 in KS2) participants. The age range was from 5 years – 10 years (total mean age =7.42, SD =4.69; KS1 mean age = 5.96, SD 0.80=; KS2 mean age = 8.88, SD =0.85).

*3.2.3 Materials*

Materials included: figure silhouettes for male and female children (see Appendix A); plain A4 paper, divided into three sections to form a trifold; a packet of colouring pencils for the drawing task; and a tape recorder for the interview. A digital camera was used to photograph children’s drawings.

*3.2.4 Procedure*

Consent was obtained in *loco parentis* from participating primary schools and individual assent was obtained from children ensuring that language was appropriate to their developmental needs. In the first instance, an information sheet was sent to the head teachers of participating schools (see Appendix B) outlining the study. They were then contacted via telephone and given the opportunity to ask any questions they may have about the study. Upon receipt of consent in *loco parentis,* children were then given an information sheet (see Appendix C) and invited to participate in the study. They were asked to sign the assent form and their right to not take part was emphasised in order to address any perceived power imbalance as a result of conducting the research in school.

Children were individually interviewed in a quiet room separate from their classroom. They completed the priming task as outlined in the design section above. They were then were given a piece of A4 paper that was divided into three sections. Each child was asked to draw a picture of an unfit or unhealthy person. The researcher then asked the child to explain why this person was unfit or unhealthy. This was to determine their definition of what it means to be unhealthy or unfit in terms of an increased body shape and size which is indicative of their definition of obesity. Children were then asked to explain what could have prevented this person from becoming unhealthy. Children were then asked to draw a second picture: what caused the person to become unfit or unhealthy. Children were given time to complete their picture and then asked to explain how each of the causal factors they had identified caused weight gain in terms of becoming unfit or unhealthy. Children were given the opportunity to talk about additional causal factors that they may not have drawn. Upon completion of this explanation, children were then asked to draw one final picture: what a person could do to ‘rub out’ the unhealthy things they have done that has caused the person to become unhealthy, in order to determine whether or not they have the cognitive capacity to engage in compensatory reasoning. Children were then asked to explain each of the behaviours they identified.

Upon completion of the activity, permission was sought from children to take a photograph of their drawing. This enabled children to retain their picture and where relevant to keep it in their Personal, Health, Social and Emotional (PHSE) well-being folder to demonstrate work on healthy and unhealthy behaviours as part of the school curriculum. Children were verbally debriefed on the aims of the study and reminded of the right to withdraw their data (see Appendix D).

The length of each interview varied ranging from 10 minutes to 40 minutes with the average interview length between 20-30 minutes. The data was transcribed verbatim and in order to maintain anonymity, children’s personal details were replaced with a unique identifier indicating the school, year group, participant number and gender of child.

*3.2.5 Analytic Technique: Content Analysis*

Content analysis (CA) seeks to analyse data within a specific context in view of the meanings a group attributes to them (Krippendorf, 1989). It involves establishing categories and then counting the number of instances in which they are used in a text or image; data that is coded using content analysis usually results in a numerical description of the features of a given text, or series of images (Joffe & Yardley, 2004). CA involves coding participants’ open-ended talk into closed categories which summarise the data (Wilkinson, 2008). The end point of the analysis may be simply to illustrate each category by means of representative quotations from the data or to quantify the data by counting the number of responses falling within each category and then summarising the number of responses in tabular form (Wilkinson). The main advantages of CA is that it can provide a summary of beliefs and offers easy comparison with other studies undertaken within a similar framework (Wilkinson).

Krippendorf identified a series of steps involved in a CA. The first step is the ‘design stage’ which is a conceptual phase during which the research question and context is defined. This study sought to understand school children’s reasoning of being unhealthy when primed for a large body size which is indicative of overweight and obesity in terms of its definition, prevention and causal factors, and whether or not they understand compensations in relation to health. An interview was conducted in order to create an inferential step between children’s beliefs and the interview data as this step formalises the knowledge available and creates the unit of analysis or ‘unitising’ which was the second step identified by Krippendorf in order to conduct a CA. ‘Coding’ the data involves classifying units in terms of the categories of the analytic constructs chosen (Krippendorf). This study adopted deductive analysis which is where the data is analysed according to an existing framework as it was clear what information was required in order to answer the research question (Patton, 2002) i.e. children’s reasoning of the health risk factors associated with overweight and obesity based on the causal factors identified in the Foresight report (2007). An inductive approach would not have been suitable as this involves identifying patterns, themes and categories which emerge out of the data (Patton) which is more suited to exploratory research. The most important phase in a CA is ‘drawing inferences’ as this *“applies the stable knowledge about how the variable accounts of coded data are related to the phenomena the researcher wants to know about.”* (p.407). This step enables the researcher to understand children’s concepts of overweight and obesity in terms of what it is, prevention and causal factors, and whether or not they understand compensations. It also enables comparisons to be made across children of differing ages.

The content analysis for this study coded interview data based on five categories, four of which were identified as contributing to weight gain in the Foresight report (2007): ‘Biology’ which included explanations based on body shape, muscles, internal body organs and physiological processes; ‘Activity’ which included explanations based on inactivity and physical activity; ‘Diet’ including any references to food and drink; and ‘Psychology’ explanations which were coded based on internal cognitive processes or emotional states; explanations coded as ‘Other’ included explanations based on factors that could not be categorised in the previous four categories outlined. Any reference to each of these categories in children’s explanation of overweight and obesity in terms of its definition, prevention, cause and nature of compensatory reasoning was coded for each child. Explanations based on activity and diet were later collapsed to comprise a ‘behavioural’ category as the Foresight report discussed diet and activity in terms of behavioural determinants of overweight and obesity.

These were the analytic steps applied to the interview data obtained using the draw-and-talk method of data collection. The pictures were not included in analysis as they were used as prompts to explore children’s underlying reasoning and cognitive capacity to engage in compensatory reasoning.

**3.3 Content Analysis**

This section will outline the results of the priming task and outlined the key features that emerged from the draw and talk activity. Results from the priming task suggest the priming activity was successful as children discussed healthy and unhealthy factors in relation to body shape and size.

Children’s responses in relation to definition, prevention, cause and compensatory reasoning were coded according to pre-defined categories based on the key determinants of weight gain identified by the Foresight report (2007). These include biology, physical activity, diet and psychological factors. For the purpose of this analysis, physical activity and diet were collapsed into one category labelled ‘behavioural factors’ as children demonstrated similar reasoning processes for both of these activities. The key features that emerged from children’s explanations will be explained followed by a summary discussion for: definition and prevention; cause; and compensatory reasoning.

When reporting data from the interviews school code A or B will be used to indicate which school the data was retrieved from, followed by the letter P with a number ranging from 1-24, followed by key stage (KS) group 1 or 2, gender (M = male, F = female) and age of participant.

*3.3.1 Priming Task*

Children’s responses to the priming task are outlined in Table 1.

**Table 1:**

*Response to silhouette priming task (N=48)*

|  |  |  |  |
| --- | --- | --- | --- |
|  | Underweight | Normal-weight | Overweight |
| Healthiest | 27 | 20 | 1 |
| Unhealthiest | 3 | 0 | 47 |

Healthy Silhouette

Children defined their choice of a healthy silhouette based on biological, behavioural and psychological factors.

Biological explanations were based around body size. The physical attributes of body shape were identified and a distinction between explanations based around being ‘thin’ and ‘not very fat’ was apparent:

*“the thinnest one”* (AP22, KS1, F, Age 6)

*“Because he’s not very fat” [silhouette 2]* (BP1, KS1, M, Age 5)

The normal weight silhouette was selected due to reasons such as:

*“…it’s not too thin and it’s not too fat.”* (AP1, KS2, F, Age 8)

The healthiest silhouette was also defined based on dietary behavioural factors:

*“Because she like ate some fruit and veg, she ate like fruit and veg and she’s only had a little bit of sweets”* (AP22, KS1, F, Age 6)

*“Because she eats less…fat food.”* (BP23, KS2, F, Age 9)

Children appear to understand the concept of ‘balance’ in relation to behavioural factors related to a healthy lifestyle:

*“…he’s too thin [picture one] so he’s been eating too much healthy things, and he’s [picture three] been eating unhealthy things, but he’s [picture two] been on the right balance.”* (AP24, KS2, M, Age 9)

An awareness of the interaction between biological factors relating to body shape with diet and activity was explained:

*“Because she’s quite skinny and so that tells you that she’s not eating too much food and she’s not eaten like too much chocolate and sweety stuff like that.”* (BP24, KS2, F, Age 9)

*“Because they’re really thin and healthy…because, the fat…when you run you get thinner, what means you’re healthier, what means you can tell”* (AP12, KS1, M, Age 6)

*“Because it looks like she’s done the most running and she’s the most thin out of all of them”* (AP9, KS2, F, Age 7)

Psychological explanations demonstrate an awareness of emotional states when discussing the healthiest silhouette based on body size:

*“…it’s probably like the most securest one.”* (BP21, KS2, M, Age 9)

Children’s explanations for their choice of a healthy silhouette were largely around biological factors in relation to body size and behavioural factors such as diet and activity, with some children demonstrating an awareness of the need for a balanced diet and the psychological implications of a healthy weight.

Unhealthy Silhouette

Children offered similar reasons when explaining their choice of an unhealthy silhouette. A common explanation based on biological factors included body size:

*“The tummy…it’s big”* (BP7, KS1, F, Age 7)

Behavioural factors in relation to diet and activity levels were explained:

*“Too much of the wrong things like chocolate and that”* (AP10, KS1, M, Age 5)

*“she probably eats a lot of junk food and not much fruit or veg.”* (AP16, KS2, F, Age 9)

“*Because she’s not been exercising.”* (AP3, KS2, F, Age 8)

The latter quotes explain the definition of an unhealthy silhouette based on individual behaviours such as diet or activity, however, children are also aware of the interaction between multiple behavioural factors such as diet and activity:

*“It shows the woman ate too much and just eats chocolates and all that. And if you eat junk food and not exercise then you get really fat…”* (AP2, KS2, F, Age 8)

The results of the priming task demonstrate consistent reasoning in children when discussing their choice of a healthy and unhealthy silhouette. Children offered explanations based on body shape and size and also inferred behaviour and emotional states based on these features too. Explanations for children’s choices of healthy and unhealthy silhouettes demonstrate that the priming task was successful in priming children to think about ‘healthy’ and ‘unhealthy’ in terms of body shape and size as an indicator of overweight and obesity.

**3.3.2 Definition and Prevention (Picture 1)**

Picture 1 sought to understand children’s definition of unhealthy when primed for body size which is indicative of their understanding of overweight and obesity. After being primed with silhouettes children were asked to draw a picture of an unhealthy or unfit person. Using the cognitive interviewing technique they were asked to explain, in more detail, why the picture they had drawn was an unfit or unhealthy person, thus offering explanations indicative of their definition of overweight and obesity. To explore this further, children were then asked about how this could have been prevented to give a more holistic view of their understanding of being unhealthy in the context of a large body size.

Children’s responses were coded according to the four categories outlined in Table 2 which indicates the number of children that offered explanations for the definition and prevention of becoming unhealthy, in terms of a large body size, within each of these categories.

**Table 2.**

*Number of explanations for definition and prevention of overweight and obesity according to determinants identified by Foresight (2007) (N=48)*

|  |  |  |
| --- | --- | --- |
| *Determinant* | Definition | Prevention |
| Biological | 42 | 33 |
| Behavioural | 38 | 47 |
| Psychological | 7 | 11 |
| Other | 0 | 0 |

Children appear to associate the indicators of overweight and obesity based around biological factors relating to body shape and size, they also infer behavioural factors in relation to levels of activity and diet, and a smaller proportion of children also identified psychological factors when explaining their definition of being unhealthy in the context of a large body size which is indicative of obesity. When discussing prevention of weight gain, children offered biological and psychological explanations based on behavioural factors in relation to diet and activity. The following section includes illustrative examples of children’s explanations of the definition and prevention of being unhealthy when primed for body size in relation to the risk factors associated with overweight and obesity.

*Biological*

A visual analysis of the body shapes drawn identified the majority of children presented endomorphic body shapes to represent an unhealthy individual after being primed for body shape.



***Figure 2.*** Picture of an endomorphic body shape to represent an unhealthy person (F, Age 7, KS1)

Children identified an increased size and shape of different body parts when explaining what defined their picture as unhealthy:

*“Fat people, unhealthy people are fat, big…”* (AP5, KS1, M, Age 5; talking to himself whilst drawing a picture of an unhealthy person)

*“Because she’s got a fat tummy and some fat arms”* (AP13, KS1, F, Age 6)

*“Well she’s got a like the big tummy look and normally if you’re healthy you don’t have a big tummy…If you’re unhealthy you have legs like that…they’re big…and her thighs… the arms aren’t very small like a healthy person would have…they’re not small…”* (BP7, KS1, F, Age 7)

*“…quite big around the stomach.”* (BP19, KS2, M, Age 9)

Children’s responses to an unhealthy individual in the context of a larger body size demonstrates the priming task was successful in guiding children to think about being unhealthy and unfitin terms of body size which is indicative of overweight and obesity.

Body size was frequently discussed in relation to a number of risk factors associated with overweight and obesity. When discussing prevention of weight gain, the biological process of food consumption was described:

*“…you know fats, they stored on fat cells…if you have too many of them then you start getting fatter and fatter and fatter and fatter…because the more fat cells you have, your body has to stretch a bit to have it in…[ good food]…doesn’t go into fat cells and it turns into faeces instead of fat cells…your body takes away the energy that it stores, because if you haven’t used the energy from it, it turns into fat cells so keeping fit is one of the most important things to keep healthy.”* (AP14, KS1, M, Age 7)

This explanation demonstrates an awareness of the interaction between diet and activity and internal bodily functions. Children infer a number of behavioural beliefs when defining an unhealthy individual and discussing preventive behaviour in relation to weight gain.

*Behavioural*

Children appear to infer a causal relationship between the physical attributes of a large body size in relation to levels of activity and diet. Low levels of physical activity and sedentary behaviour were offered as explanations to define an unhealthy individual. Explanations included different categorisations of activity levels including sedentary behaviour and lack of physical activity:

*“he’s been watching television a lot, that’s why he’s got the red marks on his eyes….”* (AP14, KS1, M, Age 7)

*“…doesn’t exercise very much, he just sits in front of the TV.”* (AP16, KS2, F, Age 9)

*“…he doesn’t like do any sports…”* (AP24, KS2, M, Age 9)

Children also identified an interaction between biological factors and activity:

*“It looks like she doesn’t take any exercise and she sits around all day…when you exercise you don’t get too wide or anything but she’s very wide.”* (AP23, KS2, F, Age 10)

*“Because she’s too fat and when you’re fat you can’t do exercise…because if you’re too wide then you find it difficult to walk…because the weight is affecting your legs…putting too much pressure on your legs.”* (AP9, KS2, F, Age 7)

The latter comment highlights that children understand there is a complex relationship between body size and engaging with activity. The causes and consequences of weight gain are bi-directional as carrying excess weight can make it difficult to engage in physical activity but lack of physical activity contributes to weight gain.

31/48 children identified engaging in physical activity as a health protective behaviour when discussing prevention of weight gain. Engaging in physical activity and avoiding sedentary behaviours were identified as preventive behaviours:

*“… you could go for a run…It would lose a bit of weight…because it helps you, helps grind down the big meals that you’ve had…when I say grind down I mean that it makes you lose more energy”* (AP7, KS1, F, Age 5)

*“…keep fit like skipping and running…it gets rid of the fat moving your body around.”* (AP8, KS2, F, Age 7)

*“…he could have like not sat in front of the TV, instead…could go outside and play with his friends and just like do lots of exercise.”* (AP16, KS2, F, Age 9)

Children demonstrate awareness that engaging in physical activity can help prevent weight gain which results from dietary intake and that prolonged screen time should also be avoided.

In addition to levels of activity, children defined an unhealthy individual based on behavioural beliefs relating to diet with 34/48 children offering dietary based explanations. The definition of an unhealthy individual was frequently explained in terms of sugar consumption:

*“Because it’s been eating too many sugary things”* (AP21, KS1, F, Age 6)

*“Cos she’s quite fat and she’s eaten lots of chocolates and sweets”* (AP20, KS1, F, Age 7)

Children also recognised that different types of diet such as those including fast food and lack of healthy food consumption are also associated with a larger body size:

*“…they just eat like fast food and stuff like McDonalds and pizza everyday instead of just for a treat, wouldn’t eat any veg or anything.”* (AP19, KS2, F, Age 10)

*“Well she doesn’t eat healthy food that much that’s why she’s unhealthy.”* (AP8, KS2, F, Age 7)

In addition to a range of explanations based on single behavioural factors, advanced explanations outlining a range of interactions between biological, activity and dietary factors were also apparent:

*“…she’s not done a lot of exercise and she’s eaten too much sugary stuff and she’s not had her five-a-day.”* (AP15, KS2, F, Age 8)

*“…she eats too much junk food…then she doesn’t do a lot of exercise so then it just turns into fat and sticks on her body…”* (AP1, KS2, F, Age 8)

*“…you can tell she’s eaten too much food because her belly’s quite big…when you’ve eaten too much chocolate, fat build up in your body and it gets stuck in your lungs and makes your body grow bigger.”* (BP24, KS2, F, Age 9)

Using concrete language to describe the process, children offer differing levels of explanations, with some explanations based on the interaction between diet and activity and other explanations which also include the additional biological process.

As with the definition of obesity, similar dietary beliefs were apparent when explaining prevention of overweight and obesity. 46/48 children discussed a range of dietary factors that could prevent weight gain including fruit and vegetable consumption, portion control and avoiding unhealthy food.

Fruit and vegetable consumption was identified as a key health protective behaviour that could prevent weight gain:

*“Eat quite a lot of veg… It would make your tummy grow smaller”* (AP5, KS1, M, Age 5)

*“Could’ve eat healthy things like…fruit and vegetables…because they’ve got healthy bitamins…they’ve got special things in them…they make you like stronger and healthier.”* (BP6, KS1, M, Age 5)

*“…eat veggy, greens…I think greens and veg just fight fat.”* (AP1, KS2, F, Age 8)

*“…she could have had five-a-day…if she didn’t have her five-a-day all the fat would build into a big ball and she could have heart disease and if she did [have her five-a-day], she’d be really healthy…”* (AP15, KS2, F, Age 8)

Fruit and vegetables are defined as healthy based on beliefs that fruit can eliminate fat and therefore should be consumed. Self-regulatory strategies in relation to food consumption were also identified including eating unhealthy food as a treat, reducing quantity of food consumed and to refrain from unhealthy food consumption:

*“Eat more healthy like healthy like have just like McDonalds and stuff as just a treat…”* (AP19, KS2, F, Age 10)

*“Not of eaten as much…unhealthy food…chocolate and sweets…”* (BP6, KS1, M, Age 5)

*“…eat a little bit of portions every time they eat…they would’ve lost a few calories, a bit of weight and if they kept on doing that they would’ve got a bit skinnier.”* (BP15, KS2, F, Age 9)

*“Stop eating unhealthy stuff and start eating healthy stuff…because she won’t be eating fat stuff anymore and she’ll start getting thinner”* (AP13, KS1, F, Age 6)

A range of interactions were identified in relation to biological, activity and dietary factors when discussing prevention of a large body size. Children offered complex explanations based on an interaction between these factors. Interactions in relation to preventing weight gain were similar to those identified when defining an unhealthy individual. Children demonstrate an understanding that healthy and unhealthy food interacts with internal body processes and results in a positive or negative outcome. Explanations of these positive and negative outcome expectations were wide ranging from ‘good’ food to ‘bad’ food and varied in the complexity of responses:

*“[chocolate has]… got lots of sugar it’s not good for you and if you just keep eating lots of it then it just tastes nice and its quite hard to not… they might get diabetes and they’ll start off getting a bit plump and then they’ll start getting fatter and fatter then they’ll they won’t look they won’t look as if they’ve done anything they’ll just look as if they’ve sat and watched TV [how does chocolate make them plump]… I don’t know”* (BP8, KS1, M, Age 7)

*“Eat less food…because if you keep on eating chocolate it will make you more and more and then you could like get cancer or horrible things”* (BP23, KS2, F, Age 9)

*“Go outside and do some sport [football, athletics, trampoline]…you’d lose a bit of weight… [by doing football]…Because you have to run quite a long way and you have to keep going back and forwards…It burns…Fat and weight…[how]… the blood in you goes round and that means that it stops like getting fat to places…You like breathe faster and your heart’s pumping more times…[how]…When you’re like sweating and you’ve done lots and lots of exercising…The blood washes, I’m not sure…It gets really warm and it like just dissolves…the fat inside…[how]…It gets a bit too warm and it’ll just like go into little bits and it’ll keep going round in your body….It would un-clog it [fat], and it’d get a bit thinner…It will just get a bit thin and go in a bit an there’ll be a bit less fat…”*(BP17, KS2, F, Age 9)

*“Exercise is good for your body and it’s very good for your heart and the slower your heart is the more unhealthy you become the faster your heart is the fitter you become… it’s good for your heart just like fruit and veg is good for your body… it’ll make your heart faster and and it’ll pump your blood around your body faster”* (BP7, KS1, F, Age 7)

In addition to these outcome expectancies based on unhealthy food consumption and levels of activity to prevent weight, children identified CHBs, unprompted, as a strategy to avoid weight gain:

*“…exercise will probably help…[how]…because if you did eat some fatty food then if you do some exercise then it can burn off calories and stuff”* (AP19, KS2, F, Age 10)

*“…she could have done 60 minutes of exercise a day…if she ate some sweets and chocolates she could burn them off [all the fat] by doing some exercise”* (AP23, KS2, F, Age 10)

*“Drink lots of water… then she would have had lots of water so she could like run and play…cos the water, it’s like goes into your body and all those fats and sugars that you’ve had, it washes them away…[how does it wash them away?]…cos it’s like a liquid and liquids are normally made of like things like lots of things that are quite sloppy…Then she’ll get like that [points to picture 2]”* (AP20, KS1, F, Age 7)

Compensatory reasoning will be explored in more detail later in this chapter but this demonstrates that CHBs are part of the reasoning process for some children when identifying strategies to prevent weight gain.

*Psychological*

Fewer children offered explanations for the definition and prevention of an unhealthy person based on psychological factors. However, some children demonstrate an awareness of a range of psychological factors implicated with a large body size. Emotional states were inferred as a direct consequence of body size as some explanations of children’s definitions included negative and positive emotional states:

*“He’s unhealthy and sad.”* (AP17, KS2, M, Age 9)

*“…that one has got the biggest smile cos it’s happier… Because it’s more healthy”* (AP7, KS1, F, Age 5)

An increased awareness of masking negative emotions was apparent when a child explained:

*“…he’s got a lot of baggage on him [weight] and he looks happy except from inside because I know that, well if, somebody’s told me before that I don’t feel very happy before about my weight, so outside he looks smiley but on the inside he’s probably not that happy about what’s happened to him…”* (AP18, KS2, M, Age 9)

This suggests children define a risk factor of overweight and obesity with negative emotional states, even when a happy face is apparent and the unhappy state is not visible. Other psychological factors that define an overweight individual include those that are considered within a person’s control such as not caring or trying:

“…*when he’s been eating he’s not cared about what he’s ate so he’s ate too much fattening food and not had a healthy balanced diet and then in his older age he’s got like bigger…in his younger years he could have stopped, he could have cared a bit more about his figure”* (AP18, KS2, M, Age 9)

*“It’s a person that doesn’t bother about doing anything or trying to be healthy, just eat unhealthy snacks and sitting in front of the TV all day.”* (BP22, KS2, F, Age 9)

*“…you just get greedier because then you ask somebody to do it for you.”* (AP14, KS1, M, Age 7)

*“…some people… are just unhealthy like they don’t need to look, they look bad like that...”* (AP10, KS1, M, Age 5)

Similar psychological factors were apparent in relation to the prevention of weight gain as children reveal negative judgements based on intention and effort:

*“Because they wanted to eat bad stuff”* (AP4, KS1, F, Age 5)

*“…she is being lazy and staying in all day so she could not be lazy and just go out and about…on a walk.”* (AP22, KS1, F, Age 6)

*“…if she had fruit and some exercise then would’ve like got a bit thinner but if she tried hard enough she wouldn’t be too thin…”* (BP14, KS2, F, Age 10)

These psychological factors suggest children identify behavioural beliefs that are within an individual’s control and define unhealthy individuals according to their level of motivation.

**3.3.2.1 Summary Discussion**

This analysis provides an insight into children’s definition of overweight and obesity, when primed for body size and discussed in terms of being unfit and unhealthy, using the draw and talk method. Children define an unhealthy individual based on an increased body size including an endomorphic body shape. A number of behavioural factors in relation to low levels of activity and a high-sugar diet accompanied children’s definition of an unhealthy individual and explanations included an interaction between biological and behavioural factors. This is similar to Babooram, Mullan and Sharpe’s (2011) findings that children identified a large stomach as a prominent feature of obesity and large limbs with a small proportion of children in their study drawing the obese figure consuming junk food such as chocolate. Children appear to demonstrate similar physical attributes and infer similar behaviour based on body size when defining obesity. Babooram et al.’s study was conducted with an Australian sample and the similarity in findings could be indicative of a prevailing perception of behavioural factors, such as consumption of unhealthy food, as defining an obese individual, based in a Western environment, where food is available in abundance.

Prevention of weight gain was discussed in relation to behavioural beliefs around fruit and vegetable consumption. Fruit and vegetables were defined as healthy based on the belief that fruit could eliminate fat and therefore should be consumed. These beliefs could influence children’s attitudes towards food choice. Whilst physiological processes are important in the understanding of food choice, they only exert an indirect impact on behaviour whereas social psychological variables such as salient beliefs are more important in developing attitudes towards food, and this information is socially transmitted based on cultural meaning of food (Conner & Armitage, 2002). Children may discuss fruit and vegetable consumption as a fat-reducing health protective behaviour due to the Department of Health’s ‘Five-a-day’ campaign (2005). This campaign encourages fruit and vegetable consumption as a positive food choice and could be an important determinant of attitudes that lead to the development of beliefs that fruit and vegetables can prevent weight gain.

A range of self-regulatory strategies in relation to food consumption were identified including eating unhealthy food as a treat, reducing quantity of food consumed and to refrain from unhealthy food consumption. These self-regulatory strategies could underpin children’s control beliefs relating to the prevention of weight gain as children suggest overconsumption of unhealthy food is within personal control and prevention of weight gain is based on modifying behaviour through choice. That is, the choice to eat less unhealthy food and to reduce portion sizes. Babooram, Mullan and Sharpe (2011) obtained children’s responses for cure/control of obesity and identified the need to exercise, eat well or decrease eating of junk food, and that the cures of obesity were one’s own responsibility. Obese individuals are depicted negatively because they are thought to have personal control over their appearance (Klaczynski, 2008). Attribution theory offers an explanation for the origins of obesity stereotypes. The assumption is that when a negative outcome such as obesity is attributed to a controllable cause, negative judgements are made (Weiner, Perry & Magnusson, 1988). Even when attempting to reduce negative stereotypes about obesity in children by introducing an intervention that stresses the importance of genetic and metabolic factors as the principle causes of obesity, thus changing children’s beliefs about the controllability of obesity, negative stereotypes of the obese were not reduced (Anesbury & Tiggeman, 2000). This current study demonstrates the early onset of control beliefs that could inform negative obesity stereotypes. Although obesity stereotypes are evident by three years of age (Cramer & Steinwert, 1998), it would be worth exploring ways to minimise such beliefs in order to prevent anti-fat biases and emotional eating which may exacerbate weight gain. These findings further support understanding of the behaviours assumed to be within one’s control and are largely confirmatory of the plethora of research that has investigated research on stigma of obesity based on lack of control (Puhl & Latner, 2007).

Children’s explanations of behavioural factors that can prevent weight gain were consistent with their explanations of the factors that define an unhealthy individual in relation to activity and diet. That is, an unhealthy individual was defined based on low levels of activity and a high-sugar diet and prevention of weight gain was explained in terms of engaging in physical activity, fruit and vegetable consumption and reducing sugar consumption. These beliefs could also inform the psychological factors that were identified when explaining the definition of an unhealthy individual as someone that does not care or try hard enough. The negativity surrounding perceived unattractiveness of overweight individuals is consistent with research that has identified some of the defining characteristics of endomorphs as being lazy, ugly and sloppy (Conner & Armitage, 2002). Negative moral judgements of being lazy appears to be a pervasive belief as previous research has identified that children as young as three years of age describe an overweight child as lazier (Brylinski & Moore, 1994; Tiggemann & Wilson-Barrett, 1998).

It has been acknowledged for some time that obesity can have severe psychological consequences (Friedman & Brownell, 1995). The current study suggests, from a young age, children appear to understand positive and negative emotional states linked to body size. The belief that an overweight individual will feel unhappy could be linked to constant negative messages about being overweight which subsequently reflect a strong anti-fat bias that is evident in the media and institutions such as schools and business (Schwartz & Brownell, 2004). Body image distress can form barriers to emotional regulation that, for both biological and psychological reasons, lead to increased eating and could form a link between obesity and depression (Schwartz & Brownell). It is therefore important to reduce an anti-fat bias and minimise emotional states associated with body size, as this might be counter-productive, causing negative emotional states and may lead to increased eating as identified by Schwartz and Brownwell.

**3.3.3 Causal Reasoning (Picture 2)**

Based on picture one, children were then asked to draw a second picture of the things that had caused the person to become unfit or unhealthy i.e. large body size to occur, which is indicative of overweight and obesity. Using the cognitive interviewing technique, children’s causal reasoning at the underlying cognitive level was obtained. Using this technique, more detailed responses of causal factors of health risks associated with overweight and obesity were obtained. Some of the causal explanations obtained from children during this particular part of the task confirmed earlier beliefs in relation to biological, behavioural and psychological factors and also identified similar interactions in relation to the causal factors. These explanations will not be included in the analytic commentary in order to avoid repetition. Therefore, this section will discuss children’s causal reasoning in relation to additional information that was presented relating to causal factors of becoming unhealthy and unfit in terms of excess weight.

**Table 3.**

*Number of children offering causal explanations of being unfit and unhealthy when primed for body size according to determinants of obesity identified by Foresight (N=48)*

|  |  |
| --- | --- |
| *Determinant* | Number of children |
| Biological | 39 |
| Behavioural | 48 |
| Psychological | 18 |
| Other | 0 |

*Biological*

Causal explanations for biological factors of weight gain were based around processes that cause body size to expand. Explanations ranged from simplistic to more advanced when discussing sweet consumption:

*“…they [sweets] like go into the body, all of the little bits that you chew, all the sugar comes out and it goes into your body and the sugar it makes you really fat [how]…Erm, don’t know that yet”* (AP20, KS1, F, Age 7)

This child recognises sugar consumption causes body size to expand but is unable to explain the process. An example of a more detailed explanation of the causal process of sweets and chocolates causing body size to expand is:

*“it’s got like all, not very nice things in them…like really bad kind of things…They just make you like fat, and you can sometimes get tummy pains with them…[how]…as they eat a lot it gets a bit wider each time…[how]…everything [sweets and chocolate] pushes together and then it extends a bit…all the skin that you’ve got around that extends…it just stays like that until you eat something healthy…[when you eat something healthy]…it eventually goes down.”* (BP20, KS2, M, Age 9)

Internal biological processes were also identified demonstrating more complex, advanced reasoning:

*“…if you have too much sugar, it can make you unhealthy and unfit so you wouldn’t be able to do stuff for very long like if you’re running you won’t be able to do it for very long because you’ll get out of breath…because like it [sugar] sticks, like it goes into your body and heart so it gives you bad diseases, like bad heart…because the sugar is really bad for your heart and it doesn’t help it, it just makes it worse.”* (AP17, KS2, M, Age 9)

*“…fat isn’t good for your heart because the fat clogs up your arteries and then the blood won’t go all around and your heart might stop beating…”* (BP13, KS2, M, Age 10) [chips and crisps]

Children explain internal body processes using concrete language but one child demonstrated advanced reasoning, referring to abstract concepts such as white blood cells:

*“Loads of fizzy pop and if he’d drink, if he didn’t drink water and just fizzy pop you don’t get enough water because your blood needs water…it will…get dry lungs or something…[why]…I don’t know but in your blood it’s like little cells and you have white cells and in the cells there’s like, well its blood and the cells would be thick but the cells get a bit bigger probably because they’ve not got enough water on them or liquid…”*(BP16, KS2, M, Age 9)

Children offer a number of biological explanations which relate to body shape and size. Explanations are related to the interaction between behavioural factors of diet and activity in relation to internal bodily functions, which are largely described using concrete terms and are used to explain the process by which body size expands as a result of the interaction, although explanations demonstrating abstract reasoning were also apparent.



***Figure 3.*** Picture identifying sweets as a causal factor of weight gain (F, Age 8, KS2)

*Behavioural*

Behavioural explanations for the cause of weight gain were explained in terms of a high-sugar, high-fat diet and low levels of activity. Children identified a range of behavioural pathogens contributing to the onset of overweight and obesity such as eating sweets, lack of exercise and unhealthy meals.

29/48 children offered causal explanations of an increased body size, which is indicative of overweight and obesity, based on low levels of activity. Causal explanations varied from simplistic to more advanced:

*“…lying down on the sofa watching television a lot… [how]… It just…no, I just know though”* (AP5, KS1, M, Age 5)

*“Just watching the tele…And staying too close to it [how]… well when you, if you have a big head from watching too much tele…Yeah it might go down to your body [how would that happen]by going making it go down your neck…[from]…Watching tele [how] …I have no idea”* (BP1, KS1, M, Age 5)

The latter quote demonstrates reasoning at Bibace and Walsh’s (1979) ‘contagion’ stage as the source of the illness was based on a single, external factor and affected the person through temporal or spatial proximity with no clear causal link. Explanations within Bibace and Walsh’s framework at the ‘internalisation’ stage were also apparent:

*“…watches it all the time, doesn’t move a bit…the only exercise he gets is walking to the fridge to get some food and walking up to bed as well…[how causes weight gain]…the fat builds up inside him so the body can’t find any more space to store the fat so it just puts it where it can.”* (AP16, KS2, F, Age 9)

The cause of an increased body size was explained in terms of internal body parts and concrete analogies were used to describe the internal process. Visible events such walking are described and demonstrates reversibility of thought as this child acknowledged weight gain could have been prevented if the person was to engage in exercise behaviour.

When discussing causal factors of weight gain, children identified dietary factors based around sugar consumption. Specific dietary items such as fizzy drinks, crisps, sweets and chocolates were identified as causal factors of obesity. Unhealthy meals were also identified as causal factors including:

*“…eating junk food…like McDonalds or Chinese takeaways”* (AP9, KS2, F, Age 7)

*“bacon, sausages”* (AP24, KS2, M, Age 9)

*“…a burger…chips…fizzy drink…”* (BP20, KS2, M, Age 9)

Explanations for how a high-sugar diet could cause weight gain varied from simplistic explanations demonstrating circular reasoning to more advanced and more complex explanations. The following quotes demonstrate circular reasoning in relation to how chocolate consumption and cake consumption can lead to weight gain:

*“Cos it’s got loads of sugar in… [how cause weight gain]…“Because it’s not very good for her…because it’s sugary.”* (AP21, KS1, F, Age 6) - [chocolate]

*“I keep on telling you because it’s got sugar in…Cos sugar has got loads of little bits of fat in…if you eat loads you get fatter and fatter and fatter and fatter and fatter and fatter and fatter and fatter and fatter and fatter…[why]…Because they eat lots of sugar”* (AP12, KS1, M, Age 6) [birthday cake]

Children understand that a high-sugar diet is unhealthy but when asked to explain why at the cognitive level, it is apparent that their reasoning is simplistic and they engage in circular reasoning, unable to offer any further explanation for how sugar causes weight gain other than because it is sugar. The following quote illustrates a more advanced explanation:

*“Well chocolate isn’t good for you and it can actually make you unhealthy…It can it can make your heart unhealthy and your heart and if your heart isn’t healthy it can’t pump your blood around very fast [how]…Well fruit and veg is good for you and chocolate isn’t …Because it isn’t good for your heart… when you do exercise it means it won’t pump as fast [how]…Not sure”* (BP7, KS1, F, Age 7)

This explanation includes reference to internal body parts using concrete language and demonstrates ‘internalisation’ of causal factors of weight gain.

Children identify the interactive nature of diet and activity, and identify causal factors of weight gain based on the additive effects of over-consumption and lack of physical activity:

*“…chocolate has a lot of sugar in and so that doesn’t help your body at all…it’s like going down into your system and if you’re not doing any exercise it’s just making you fatter and you’re not doing anything to stop…[exercise would]…burn off a bit of the sugar but not maybe not all of it…some of it would like dissolve but some of it would stay there and you’d have to like that’d stick there so you wouldn’t be able to get it out like get it off…you just get fatter and like if you have another chocolate bar…it just joins up with that fat and makes you fatter.”* (AP17, KS2, M, Age 9)

*“If you eat a lot of fat, the fat is the thing what gets you exercising and it all gets stored in you until you use it, and if you don’t use it, it gets stored in you for ages and then you get fatter and fatter and fatter”* (BP12, KS1, F, Age 6)

This latter quote recognises the interactive nature of food as energy and the need to utilise the energy by engaging in physical activity. According to Bibace and Walsh (1979), explanations from children aged 6 years would be limited to identifying single, causal factors within the preoperational stage but clearly some children demonstrate reasoning that is more advanced. This also demonstrates that some children, from a very young age, can engage in health protective behaviour such as physical activity to avoid gaining weight.

Whilst exploring the underlying reasoning of inactivity as a causal factor of weight gain an unprompted CHB was stated:

*“…if you lazy around and just eat junk food, junk food has a lot of sugar in…if like you jog and eat some junk food then it will wear all the junk food off…because if you run…the sweat is like pieces of junk food or something like that and you know when you run you start sweating…all the junk food starts going away.”* (AP2, KS2, F, Age 8)

CHBs will be explored further later in this chapter but it is apparent that some children negotiate healthy and unhealthy behaviours by engaging in compensatory reasoning when discussing behavioural risk factors associated with overweight and obesity in terms of diet and activity.

*Psychological*

Psychological explanations for the cause of obesity include lack of knowledge, temptations and addiction, and the concept of morality:

*“Because…when you don’t know it’s good for you but you start getting fatter and then you realise it’s not good for you”* (AP13, KS1, F, Age 6) [high-sugar snacks]

The feeling of temptation was described in relation to high-sugar snacks:

*“[chocolate has]…got this things in them makes you want more and more and more.”* (BP23, KS2, F, Age 9)

*“…if you eat one sugary thing you’re happy for a bit and then you feel like you have to have more and more and then it builds up inside you…because it’s got like lots of sugar in it and it makes your sugar cells go a bit high.”* (BP14, KS2, F, Age 10)

*“Because cakes have sugar in them…once you’ve chewed it you can actually, it tastes nicer because when you’re chewing it, it tastes nice…”* (AP6, KS1, M, Age 5)

Children also identify psychological attributes of addiction in relation to diet and activity:

*“…they might get addicted to doing nothing and…they wouldn’t exercise so they wouldn’t get any healthier.”* (BP22, KS2, F, Age 9)

*“…every time you eat something like a chocolate bar you sometimes want more of it because it’s so good and everything and you sometimes want more of it and you get addicted to it and you don’t eat anything healthy that will keep you healthy so then you’ll get unhealthier.”* (BP22, KS2, F, Age 9)

Explanations which acknowledge the role of temptations and addiction highlight children’s awareness of the distinction between the body and the mind in relation to causal factors of weight gain. According to Bibace and Walsh (1979) this type of reasoning would not be apparent until at least the age of 12 years.

Immoral behaviour was explained in terms of food consumption:

*“Well what happens is the person gets fat and fat and they really think they should get…some people think they should eat lots of apples but they’re good people but some bad people want to stay bad. If they eat things that are bad that makes them bad people…It’s because if they eat bad things, like bad people eat chewing gum and good people eat apples but the bad people eat these kind of stuff and the good people eat apples and other stuff…[why]…I can’t really say it but it’s something that’s making it really bad for you”* (P22, Age 6, KS1)

This type of reasoning can be understood in terms of immanent justice where illness and misfortune are explained in terms of behaviour and punishment (Croker, 2012) but this can also be explained in terms of social judgements based on anti-fat attitudes (Conner & Armitage, 2002).

**3.3.3.1** **Summary Discussion**

Children’s causal explanations offer a deeper insight into beliefs underpinning risk factors for weight gain. Children’s explanations based on biological factors were in relation to body size. A number of behavioural causal factors included low levels of physical activity and dietary factors based on a high-sugar and high-fat diet. This is consistent with the behavioural determinants identified in the Foresight report (2007) and previous research in which children identify consumption of junk food and low levels of activity as a prominent cause of obesity (Babooram, Mullan & Sharpe, 2011).

Whilst many children identified low levels of physical activity as a causal factor of weight gain, some children did not identify this as a causal factor. Previous research has identified similar findings. Babooram, Mullan and Sharpe (2011) found almost half of children interviewed in their study did not mention sedentary behaviour as a cause of obesity. Babooram et al. explain this could be as a result of poor understanding of sedentary behaviours and interventions need to directly address how sedentary behaviours lead to obesity in order to encourage children to identify their own patterns of this type of behaviour.

In contrast with explanations based on activity levels, all children identified an unhealthy diet as a causal factor of weight gain. Children’s explanations were varied ranging from simplistic to more advanced, complex reasoning. Some explanations were based on a single, external source of weight gain with no clear causal pathway between the source and weight which was typical of an explanation based on Bibace and Walsh’s (1979) ‘phenomenism’ and ‘contagion’ stages. Conversely, some KS1 children demonstrated reasoning at this stage of developmental reasoning but children of a similar age also offered more advanced explanations which include internal body processes using concrete language, demonstrating ‘internalisation’ which Bibace and Walsh identify with children aged 7 onwards. Similar differences were apparent in KS2 children who offered many explanations at the ‘internalisation’ stage consistent with Bibace and Walsh’s prescribed framework. However, some children in KS2 demonstrated reasoning at the formal operational stage demonstrating an awareness of physiological and psychophysiological processes involved in weight gain. These findings lend support to cognitive-developmental theories which emphasise the role of experience such as Vygotsky (1978), as children’s casual explanations that were beyond Bibace and Walsh’s prescribed framework were based on dietary factors. This could be understood based on children’s increased opportunities to regulate dietary food choices relating to snacks such as sweets when compared with opportunities to regulate behaviour in relation to physical activity. Similar findings were apparent in Myant and Williams (2005) study of children’s concepts of health and illness. They found that children’s explanations became more sophisticated with age but that children held differing levels of understanding for different illnesses demonstrating more advanced reasoning for illnesses they had personal experience of such as chicken pox compared with other illnesses that they were less familiar with. These findings support Vygotsky’s idea the children develop higher-level mental functioning based on their interactions with the environment (Vygotsky, 1978).

Causal reasoning based on psychological explanations included desire, temptations and the concept of immoral justice. A number of theories seek to explain food preference. Research suggests there is an innate preference for sweet tasting substances (Conner & Armitage, 2002). Liking is the hedonic pleasure brought about by the taste experience of sweet food and the human brain is ‘hardwired’ to like these tastes from birth (Dovey, 2010). Children describe this hedonic pleasure and identify this pleasurable experience which triggers unhealthy food consumption as the cause of weight gain. Explanations based on immoral justice can be understood in behavioural terms and in terms of social judgements. Associating healthy food with good people and unhealthy food with bad people can be understood in terms of social judgements in the wider environment. Crandall (1994) identified people that held anti-fat attitudes believed in a just world i.e. ‘bad things happen to bad people’ and people who are overweight are responsible for their weight and lack of self-control. It is unsurprising that fewer children discussed psychological factors in relation to weight gain as psychological concepts such as describing temptations or intentions are abstract concepts which will continue to develop in children based on increased opportunities within the environment to regulate behaviour.

In the current study, children identified a range of interactions between behavioural and biological processes thus demonstrating flexibility and reversibility of thought. This indicates children understand that multiple behaviours can contribute to weight gain either due to lack of engagement in a health protective behaviour or as a result of engaging in a health-risk behaviour.

In conclusion, children identified a larger number of dietary behaviours as causal factors of obesity than for any other explanations. Their reasoning varied ranging from simplistic to more advanced reasoning with many children offering some explanations beyond Bibace and Walsh’s prescribed framework, particularly in relation to dietary factors. Myant and Williams (2005) recognised that children offer varied levels of explanations for different domains based on their level of experience with each of these. Children have access to a range of snacks but might have fewer choices regarding physical activity and this could explain the difference in explanations for diet and activity as causal factors of weight gain.

**3.3.4 Compensatory Reasoning (Picture 3)**

Unprompted compensatory health beliefs (CHBs) were identified in relation to diet and activity when discussing prevention and cause of weight gain. However, children were specifically asked about compensations during this study. Based on the discussion resulting from children’s pictures of causal factors, children were then asked to draw a final picture of things that could ‘rub out’ the unhealthy behaviours that had been discussed. Using the clinical interviewing technique, they were asked to explain their pictures in more detail. This was to assess whether or not children had the cognitive capacity to engage in compensatory reasoning.

**Table 4.**

*Number of children offering causal explanations of CHBs in relation to determinants of obesity identified by Foresight (N=48)*

|  |  |
| --- | --- |
| *Determinant* | Compensatory Reasoning |
| Biological | 33 |
| Behavioural | 46 |
| Psychological | 1 |
| Other | 0 |
| *Potential to compensate* | 39 |

Compensatory reasoning appears to be a more advanced reasoning strategy that requires reversibility in thought, and as a result some very young children struggled to talk about CHBs. It is important to note that some children offered explanations of CHBs but when their underlying reasoning was explored using the cognitive interviewing technique, it became apparent that they did not demonstrate sufficient cognitive capacity to engage in compensatory reasoning. Thus there was a distinction between the ability to state a belief and to demonstrate the potential to compensate at the underlying cognitive level.



***Figure 4.*** CHB based on single behavioural factor (Male, Age 7, KS1)



***Figure 5.*** CHBs based on multiple behavioural factors (Female, Age 8, KS2)

*Biological*

The nature of compensatory reasoning is based on an interaction between two behaviours i.e. one healthy behaviour eliminating the negative effects of another unhealthy behaviour. Many explanations of CHBs were biological and were explained in terms of body size, internal bodily functions and invisible internal processes to explain the interaction between diet and activity.

The following explanation demonstrates compensatory reasoning of sweet consumption by engaging in weight lifting:

*“…because all the sugar that was in the sweets would be in your body and if you did weight lifting it might start to wear things wear it off as you are using energy…It would wear off your fatness [how]…Because it’s using your energy if you do it outside its giving you lots of fresh air and its really good for you [how]…because it’s using your legs and lots of parts of your body****…****because it makes you tired but it or I don’t know why”* (BP8, KS1, M, Age 7)

Compensatory reasoning requires children to have reversibility in thought. Explanations of compensations in terms of an interaction between multiple external sources which interact with internal body organs and refer to invisible functions was apparent. The following quotes explain the interaction between physical activity and fruit and vegetable consumption in order to compensate for causal factors of weight gain:

*“Well it helps[physical activity], it helps fruit and veg to rub away the small arteries and it helps the heart to pump the blood round”* (BP7, KS1, F, Age 7)

*“Because they’ve got vitamin C…it will start help to help your white blood cells stay white…Because it starts to make them a bit good and then if it you carry on doing it [eating fruit], it will start to wear off your fatness [how] because of your white blood cells and the vitamin C working it to try and make you do more exercise [how]…I don’t know*” (BP8, KS1, M, Age 7)

CHBs based on biological processes were explained across a number of behaviours. An example includes fruit and vegetables compensating for burgers and crisps:

*“Well they contain lots of vitamins and they could fight back all the germs and the fat and then it’s better and easier to get rid of, and that’s it really…[how]…it’ll be easier to like get them away and the fruit will help get the fat away because the fruit doesn’t have much fat and the fat go with it…[how]…the fat sits and clings onto the fruit and veg instead…it goes into your intestines”* (AP16, KS2, F, Age 9)

Children’s underlying reasoning of compensations indicates an awareness of internal processes, body organs and an interaction with behavioural factors relating to diet and physical activity.

*Behavioural*

Physical activity and fruit and vegetable consumption were identified as key compensatory behaviours. 38/48 children identified CHBs in relation to activity and 41/48 children identified CHBs in relation to diet.

CHBs based on physical activity were explained in relation to an unhealthy diet:

“*Because its making you fit and it’s getting, it get crumbly and just it’ll fect out of your tummy [what will get crumbly?]…Your bad stuff [how will running help?] Because it makes it fit, it makes you good and fit”* (AP4, KS1, F, Age 5)

*“Cause every time your heart thumps it rubs one bit away…It rubs the fatness away [how]…By your heart thumping [how]…By running”* (BP1, KS1, M, Age 5)

*“It’d like, the blood would keep pumping more and the blood like, keep getting in it’d get warmer and warmer because your running more and it’s like, make the fat dissolve in it…[how]…It gets like really warm and just, and it’s just goes into little bits.”* (BP17, KS2, M, Age 10)

*“The biking…walking…treadmill…gives you strength in your legs…weight lifting gives you strength in your arms, running gives you strength in well your arms and your legs cos when you’re running you’re doing that and they could do, it would work it away because when it’s pumping, when the blood flows around the body it’s like your blood’s quite warm…so it’s like rubbing away all of the fat because it’s like burning it all away…[how]…I don’t actually know really”* (AP18, KS2, M, Age 9)

In addition to physical activity, children also identify fruit and vegetable consumption as a key compensatory behaviour. Children’s underlying explanations were varied ranging from simplistic to more detailed explanations:

*“All the sugar and the sweets [how]…I don’t know [why] because it hasn’t got any sugar in it”* (AP12, KS1, M, Age 6)

*“It can like, it’s got lots of good things in it and like they have little like shield things and if like those things try to get past these good things then they can’t and they all like end up dead…Cos they like have guns that they shoot them with”* (AP20, KS1, M, Age 7)

*“When fruit and veg goes down it gets fat and sweeps it away, that helps [to] skip and then I think it goes round your body easier…So that it can help your blood go all the way round so it’s easier for her to do skipping…[how]…cos the veins get wider and because there’s not fat around it but there will be a bit cos you can still eat a little bit of fat…it will get wider so that the bloods easier to move around you just have to try and get past the fat…[what makes the veins go wider]…The fats going away…They don’t necessarily go wider but the fats go away…[what causes the fat to go away]…the vegetables really push it I think”* (AP8, KS2, F, Age 7)

Children identify the micro and macro nutrients present in food as a causal explanation for fruit and vegetable consumption having compensatory properties capable of eliminating fat:

*“[Juice]…vitamins and energy get your insides all healthy and all clean all the fat off…[do you know how]…not really.”*(BP20, KS2, M, Age 9)

*“Fruits got like vitamins and vitamins like replace the fat… [how]…The vitamins get stuck on the fat and then it all gets covered in it so it just like a piece of vitamins they go in the blood stream. The vitamin get stuck on the fat…and then it all gets covered in it so it takes away all the fat…and then it gets back in the blood stream…and then all the vitamins go around in your body…[then what happens]…You get more energy so then you can burn off some more weight…[how]…Because they like, give you…”* (BP17, KS2, M, Age 10)

*“[vegetables]…they’ve got things like vitamins and stuff in them…the vitamins get into your bones and start making your bones strong so they can fight the fat and things like that…[how]…if the fat’s in the bones, the bones soak it up and things like that…[the vitamins]…make your bones stronger.”* (BP19, KS2, M, Age 9)

The quantity of compensatory behaviour engaged in is a consideration for some children. The following quote explains a CHB in relation to vegetables and crisps:

*“It depends on how many crisps if you have like more than a packet you couldn’t burn the fat away but if you had just half a packet or full packet you would be able to and it depends on how much vegetables they have…[how many]…Probably about three or four different vegetables however much you can fit in your hand in each one.”* (BP19, KS2, M, Age 9)

Water was also identified as a compensatory behaviour:

*“It’s some water…It can like erm…it goes into your body, and it like erm washes away all the like salt and stuff in the coke and the chocolate and sweets …[how]… Cos it’s like really sloppy and quite like a liquid and liquids…[how]…I don’t know”* (AP20, KS1, F, Age 7)

*“Water because water can make you blood go faster. It could make it move faster…It goes a bit wavey and can sweep all the fat from the sides…The fats in the blood stream and then it carries it back up to the stomach and then it put it like, goes through the digestive system again”* (BP17, KS2, M, Age 10)

Behavioural factors in relation to diet and activity have been identified as having compensatory properties which are capable of eliminating fat. Children’s explanations of the compensatory process range from simplistic, concrete to advanced reasoning based on biological factors of internal processes.

*Psychological*

Only one child identified a psychological explanation at the underlying level to explain compensatory reasoning:

*“[Exercising]* *…it’ll slowly get easier and easier…[because]…they get used to doing it…when they move they can burn off the fat and if they keep doing it they’ll slowly go back to that picture.”* (AP23, KS2, F, Age 10)

This demonstrates the importance of habit formation. Habit formation has been identified as impeding the ability to resist temptation in relation to unhealthy behaviours (Foresight, 2007). As CHBs are a cognitive, self-regulatory strategy, they could be used to override habit formation by activating conscious regulatory strategies to modify behaviour.

**3.3.4.1 Summary Discussion**

Physical activity and diet were identified as key compensatory behaviours. They were explained in biological terms which identified the interaction between multiple external sources including unhealthy sources, such as sweets, and healthy sources, such as fruit and vegetable consumption, with internal bodily functions such as unblocking arteries, in order to eliminate the sugar or fat consumed that can contribute to weight gain. This type of reasoning requires flexibility and reversibility in thought and was apparent in many children in this study.

Very few children offered explanations of compensatory reasoning based on psychological processes such as intentions or motivation, and this could be understood in terms of the reliance on abstract reasoning of multiple factors which might occur as children get older and their cognitive-development advances with age and experience. Most children identify factors relating to diet and activity as these are concrete behaviours which are more readily available in their environment making it easier to develop reasoning strategies as these are behaviours that they have experience of regulating.

The nature of compensatory reasoning that was demonstrated by children in this study is in line with cognitive self-regulatory processes apparent in adults (Knauper, Rabiau, Cohen & Patriciu, 2004). Children hold a range of positive outcome expectations for physical activity and diet. These outcome expectations inform their beliefs about physical activity and fruit and vegetable consumption having the ability to compensate for the negative effects of unhealthy behaviours that were identified as causing weight gain.

**3.4 General Discussion**

The aim of this study was to explore children’s causal reasoning in relation to an increased body size, which is indicative of overweight and obesity, in terms of how it is defined, prevented and caused; children’s cognitive capacity to engage in compensatory reasoning was also explored.

Children identify consistent factors that define, prevent and cause overweight and obesity when primed to think about being unhealthy in terms of body shape. These factors were also apparent when engaging in compensatory reasoning. Children in this study define unhealthiness in the context of a large body shape, indicative of obesity, based on an endomorphic body shape. They appear to infer a causal relationship between physical attributes of body shape and size in relation to an unhealthy diet and lack of physical activity. Children offered diet and activity as defining behavioural features of overweight and obesity. Emotional states were inferred such as feeling sad and other psychological factors relating to personal control, which suggest overweight and obese individuals do not care about their diet or activity and become overweight as a result of their behavioural choices.

Understanding children’s beliefs in relation to the prevention of weight gain suggests children are aware that they can engage in behaviour to maintain health from as young as five years of age. Preventive factors were identified as engaging in physical activity and fruit and vegetable consumption. Reducing portion sizes and avoiding sedentary behaviours were identified at a biological and psychological level and these self-regulatory strategies reinforce the idea that prevention of weight gain is within one’s control.

Children identified a range of behavioural pathogens contributing to the onset of overweight and obesity such as eating unhealthy snacks and unhealthy dinners. Children’s knowledge and explanations varied ranging from simplistic to more advance across all health domains. Some children offered explanations of causal reasoning in line with Bibace and Walsh’s (1979) prescribed framework whereas some children of the same age offered explanations beyond Bibace and Walsh’s framework. More advanced explanations were more apparent when discussing dietary causal factors of obesity. This advanced reasoning could result from children’s increased access to dietary choices in their environment. This supports the idea that there is variation in children’s understandings of health across a number of domains which is based on their experience and exposure (Myant & Williams, 2005). These findings can support the development of national health promotion campaigns to incorporate developmentally appropriate messages, which according to this study could be pitched at a higher level for dietary behaviours than a traditional Piagetian framework would assume, but to ensure language remains concrete as not many children demonstrated high-level abstract reasoning in relation to causal factors of weight gain.

Children appear to have the cognitive capacity to engage in compensatory reasoning. Physical activity and fruit and vegetable consumption were identified as key compensatory behaviours and explained in biological terms as an interaction between these external behaviours and internal bodily functions to explain compensations. Very few children could offer explanations for compensatory reasoning based on psychological processes as this relies on abstract reasoning which becomes more advanced with age and experience. Most children identify factors relating to diet and activity as these are concrete behaviours which are more readily available in their environment. Children appear to explain CHBs consistent with adult literature, that is, the negative effects of an unhealthy behaviour can be eliminated with a healthy behaviour (Knauper, Rabiau, Cohen & Patriciu, 2004).

There are a number of theories that seek to explain children’s understanding of health behaviour and cognitive theories offer a range of explanations for the differences in children’s reasoning. Some researchers focus on what children know whereas other researchers investigate the possible mechanisms by which changes occur (Kuhn, 2002). The focus of the current study was to understand what children know in relation to overweight and obesity based on its definition, prevention and cause as this knowledge and understanding of the risk factors associated with overweight and obesity can support the development of public health interventions that are consistent with children’s understanding in terms of what it is, how it can be prevented and its causal factors. Understanding the possible mechanisms by which conceptual changes occur was not the aim of this study. Future research could explore the mechanisms by which children’s compensatory reasoning develops.

Limitations of the current study could include use of terms ‘unhealthy’ and ‘unfit’ as indicative of obesity when primed for body shape and size as this limits the claims of understanding overweight and obesity at the cognitive level. A different approach could have been to introduce the term ‘obesity’ to children as a result of the priming task and to explore their reasoning using the term ‘obesity’. However, public health strategies such as the UK government’s Change4Life strategy explicitly avoid use of the term ‘obesity’ and aim to tackle obesity by encouraging children to eat well and become more physically active (Piggin & Lee, 2011). Primary schools also avoid use of the term ‘obesity’ and discuss this in terms of being ‘unfit’ and ‘unhealthy’ (personal communication with primary school children teachers). As a result, children may remain unfamiliar with the term ‘obesity’ even after being introduced to it in the context of a priming task which would question the validity of resulting data if children respond to questions based on a concept they are unfamiliar with.

In conclusion, children hold consistent behavioural beliefs in relation to diet and activity in terms of the definition, prevention and cause of weight gain when primed for a large body size and they have the cognitive capacity to engage in compensatory reasoning which requires flexibility and reversibility in thought. Children’s reasoning was varied ranging from simplistic to more complex across a range of health domains. Children can identify health-risk avoidance and remedial behaviours and understand the idea that one behaviour can be employed to negate the risk posed by performing another behaviour, thus demonstrating the cognitive capacity for compensatory reasoning.

**CHAPTER 4**

**Focus Group Study**

**4.1 Introduction**

Behaviours implicated in the onset of overweight and obesity in children include: low levels of physical activity and inactivity related to screen time such as prolonged television viewing and inactive computer gaming (Health and Social Care Information Centre, 2014; Jimenez-Pavon, Kelly & Reilly, 2010; Reilly, 2008; Eisenmann, Bartee & Wang, 2002), a diet which is high in fat and sugar, and low in fruit and vegetable consumption (Marshall, O’Donohoe & Kline, 2007; Gavin, 2008; Ludwig, Peterson & Gortmaker, 2001; Brown & Summerbell, 2009), restricted sleep (Marshall, Glozier & Grunstein, 2008) and skipping meals (NHS, 2008).

A number of health campaigns such as: the Department of Health’s ‘Eat 5-a-day’ campaign which encourages children to eat at least five portions of fruit and vegetables a day (Department of Health, 2004); television shows such as ‘Lazy Town’ which encourage children to play outside, be active and eat ‘sports candy’ also known as fruit and vegetables (Marshall, O’Donohoe & Kline, 2007); and the ‘Change4Life’ campaign which encourages adults and children to eat a healthy diet and engage in physical activity (Department of Health, 2011b) all aim to improve and encourage a healthy lifestyle in children and prevent the onset of overweight and obesity. However, as the most recent HSCIC (2014) statistics demonstrate, children still do not eat enough fruit and vegetables with a mean number of 3.0 and 3.3 portions of fruit and vegetables consumed by boys and girls respectively. England has the highest levels of sugary soft drink consumption among 38 OECD countries with just under 40% of children reporting they drink soft drinks at least once daily (Public Health England, 2013). Children do not engage in sufficient levels of physical activity with more than 75% of children aged 5-15 years not meeting the recommended guidelines for physical activity (HSCIC). A large proportion of children report engaging in more than two hours of screen time a day with 62% of 11-year olds watching more than two hours of TV a day on weekdays (Public Health England).

Psychological theories such as the Theory of Planned Behaviour (Ajzen, 1991) and Social Cognitive Theory (Bandura, 1977) have identified different types of beliefs that can contribute towards understanding human motivation and behaviour. Erjavec, Viktor, Horne and Lowe (2012) identify the importance of understanding beliefs and attitudes in childhood as attitudes to health and patterns of behaviour are established early in life; which identifies this period as important in the attempt to meet targets identified most important for health and well-being.

Beliefs can be understood based on Fishbein and Ajzen’s (1975) expectancy-value model of attitudes. According to this model, attitudes develop from the beliefs people hold about the object of the attitude. Beliefs are formed about an object by associating it with certain attributes, i.e. with other objects, characteristics, or events (Ajzen, 1991). Each belief links the behaviour to an expected outcome. These are known as outcome expectancy beliefs (Bandura, 1977). The positive or negative evaluation of such outcomes forms an attitude towards a particular behaviour (Ajzen). In the context of health risk and health protective behaviours beliefs could be understood in terms of consequences resulting from engaging in a certain behaviour. An example of this is the belief that eating cake can cause weight gain. The positive or negative evaluation of this belief, e.g. it is desirable to gain weight or gaining weight is undesirable, would then form a positive or negative attitude towards cake consumption, with an increased likelihood to perform the behaviour that is identified with a valued outcome and avoidance of behaviour that has an unfavourable outcome expectancy (Bandura, 1977).

Research has shown that external influences are at play in shaping the underlying structure of food attitudes (Cervellon & Dube, 2005). A number of factors influence children’s beliefs including family and peer influence with children more likely to develop attitudes in relation to diet that are similar with parents and friends (Draxten, Fulkerson, Friend, Flattum & Schow, 2014). This has also been shown for other behaviour such as physical activity (Lindsay, Sussner, Kim & Gortmaker, 2006).

Beliefs can also be understood in terms of self-efficacy, that is, the belief of one’s capabilities to perform a particular behaviour (Bandura, 1997). Self-efficacy has been identified as an important predictor of health behaviour change and as a result is included in most social cognitive theories (Morrison & Bennett, 2012). Suton et al. (2013) examined the association of self-efficacy and fatness with physical activity in children aged 10 years. They found children with high self-efficacy participated in significantly more physical activity compared to children with low self-efficacy.

Attitudes, self-efficacy and outcome expectancy beliefs are psychological constructs that are included in the adult compensatory health belief (CHB) model (Knauper, Rabiau, Cohen & Patriciu, 2004). This section will provide a brief overview of the adult CHB model as a more detailed overview has been provided in chapter 1. The adult CHB model stipulates that when faced with unhealthy but tempting options that conflict with health goals, cognitive dissonance occurs and is alleviated by either: resisting the temptation; changing outcome expectancies e.g. tempting behaviour is unlikely to compromise health goals; or to activate a CHB, that is, to reason that the unhealthy behaviour can be indulged in and the unhealthy consequences can be eliminated by engaging in another healthy behaviour. Each of these strategies will alleviate the cognitive dissonance experienced but activation of a CHB has been identified as the easiest of the three options to employ as the desired behaviour can be engaged in without any feelings of guilt or discomfort (Rabiau, Knauper & Miquelon, 2006).

CHBs are associated with poorer health outcomes as they have been associated with lower intentions to quit smoking in adolescents (Radtke, Scholz, Keller, Knauper & Hornung, 2011) and lower intentions to be physically active in adolescents (Berli, Loretini, Radtke, Hornung & Scholz, 2014). The first study in this programme of research has established this is not just an adult and adolescent reasoning process as children have the cognitive capacity to engage in compensatory reasoning. Study 1 presented children with a relatively abstract third-person task but did not explore the specific health domains in which children personally hold CHBs. The current study will explore children’s health beliefs from a first-person perspective. If children develop CHBs to justify their choice of diet, levels of inactivity, media engagement and sleep levels then these beliefs need to be understood in order to develop interventions that target such beliefs and not simply aim to increase knowledge, as the CHB model would suggest unhealthy behaviours are not due to a lack of knowledge per se, but a distorted understanding between the construction of a compensatory belief and implementation of a corrective behaviour. Adaptive beliefs could be promoted or maladaptive beliefs could be challenged, and such interventions may encourage children to eat a healthy diet and engage in the recommended guidelines for physical activity.

The aim of this study was two-fold: i) to explore children’s beliefs specifically in relation to CHBs for healthy lifestyle behaviours; ii) to consider the influences on children’s CHBs.

**4.2 Methodology**

*4.2.1 Design*

Focus groups (FGs) were conducted to explore whether children hold CHBs across a range of health domains.

A FG schedule was developed (see Appendix E) to guide discussions using language appropriate to children’s social and cognitive capabilities (Heary & Hennessy, 2002). This included ensuring use of language was not beyond their comprehension and the FGs were not too long in duration in order to sustain their attention. The FG schedule was developed based on previous literature that identified behavioural risk factors associated with overweight and obesity. These include: physical activity levels (Department of Health, 2005); prolonged screen time activities (Eisenmann, Bartee & Wang, 2002); a diet high in fat and low in fruit and vegetables (Marshall, O’Donohoe & Kline, 2007); a high-sugar diet (Gavin, 2008; Ludwig, Peterson & Gortmaker, 2001); restricted sleep (Marshall, Glozier & Grunstein, 2008); and skipping meals (NHS, 2008). This schedule guided the FG discussion in order to explore children’s health beliefs in relation to these behaviours.

FGs were convened in accordance to guidelines reported by Heary and Hennessy (2002). These included the optimum size of FGs with children to include between four and six participants per group, and a recommendation that the ideal length of time for FGs with children to last approximately 45 minutes.

Children that participated in the FG discussions were all from the same class. They were familiar with each other which meant the responses elicited would be much more open and the group would feel at ease with each other requiring less intervention from the researcher than a non-familiar group (Davis & Jones, 1996).

*4.2.2 Participants*

Participants were recruited from one primary school in the Midlands region of the United Kingdom.

School 2 was an urban primary school. According to the school Ofsted report this is a community primary school with approximately 200 children in the age range 4-11years. Most pupils are from White British backgrounds and the proportion of pupils eligible for free school meals is well below average. According to the Office for National Statistics 2011 census data, using the Index of Total Deprivation 2010 the neighbourhood this school was located in had an Index of Total Deprivation rank of 22362 out of 32482.

The inclusion criterion was: children are aged between 5-11 years and will need to have conversational skills in English language in order to participate in the focus group discussion. The exclusion criteria was: children who do not have conversational English language skills but additional advice was sought from teaching staff to identify children that were unable to participate due to language difficulties.

In total 35 participants aged between 5- 10 years took part in this study (mean age= 7.29, S.D= 1.69) with 17 children from KS1 (mean age= 5.76, S.D=0.56) and 18 children from KS2 (mean age= 8.72, S.D=0.96). There was a fairly even gender split with 18 female participants (8 in KS1 and 10 in KS2) and 17 male participants (9 in KS1 and 8 in KS2).

A total of six FGs were conducted: three FGs with KS1 children and three FGs with KS2 children. All children in KS1 were in year groups 1 and 2. KS2 year groups differed, with one group in year 3 and 4, one group in year 4 and 5, and one group in year 5 and 6.

*4.2.3 Materials*

A focus group schedule was used to guide the discussion (see Appendix E) and a tape recorder was used to record the discussion.

*4.2.4 Procedure*

Consent was obtained in *loco parentis* from the participating primary school which involved sending an information sheet (see Appendix F) outlining the study aims, speaking to the head teacher of the school and providing an opportunity to ask any questions in relation to the study. Individual assent was then obtained from children, both verbal and written. Children were given an information sheet (see Appendix G) and invited to participate in the study. Their right to withdraw from the study, confidentiality and anonymity were explained. Children were given an opportunity to ask any questions they may have. Assent forms were then obtained and the FG discussions commenced.

FG discussions varied in duration. The shortest discussion lasted 31 minutes and the longest discussion lasted 58 minutes. Each discussion was guided by the FG schedule although not all of the topics listed in the schedule were discussed due to time constraints. The FG discussions were led by children; they were encouraged to discuss behaviours that prevented them from engaging in a healthy lifestyle in depth and not breadth, to enable the researcher to obtain a deeper understanding of the nature of CHBs that children might hold.

At the end of each FG, children were reminded of their right to withdraw and were fully debriefed both verbally and with a debrief sheet (see Appendix H) which included more detailed information about the study and provided contact details of the researcher. One child emailed the researcher after FG participation to express a positive experience resulting from participation in the study.

FG data was transcribed verbatim, imported into NVivo 8 and subject to thematic analysis (Braun & Clarke, 2006) in order to identify emerging themes in relation to children’s health beliefs. In order to maintain anonymity, pseudonyms were used to protect children’s identity.

*4.2.5 Analytic Technique: Thematic Analysis*

Adopting a critical realist approach (Bhaskar, 1989) a thematic analysis was employed to analyse the FG interview data. *“Thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data.”* (Braun & Clarke, 2006, p.79). It is a flexible method of analysing and reporting themes within data as it does not subscribe itself to a pre-existing framework and offers clear guidelines on what constitutes a ‘theme’ (Braun & Clarke). This method has been identified as useful when investigating “*an under-researched area, or when working with participants whose views on the topic are not known”* (p.83, Braun & Clarke). Other analytic techniques such as Interpretative Phenomenological Analysis (IPA) which is designed to explore in-depth subjective experiences (Smith, 1996) and conversation analysis (CA) which focuses on use of language and turn taking to make inferences of individual’s beliefs (Sacks, Schegloff & Jefferson, 1977) are unsuitable to achieve the aims of this study. Children’s in-depth experiences are not explored and their developing social and language skills suggest IPA and CA are unsuitable methods of analysis for this study. As there is no current literature that has addressed CHBs in children, a thematic analysis appears to offer a suitable analytic approach on FG data to identify whether or not children hold CHBs in relation to a number of health domains.

Braun and Clarke (2006) defined a theme as having some level of patterned response or meaning within the data set. Due to the exploratory nature of this study, data was coded inductively to allow patterns and themes to emerge that were grounded in the data. Themes identified using this approach involved a process of coding the data without trying to fit it into a pre-existing coding frame (Braun & Clarke).

Braun and Clarke’s (2006) six phase guide to performing thematic analysis was carried out on the FG data. Phase one involved becoming familiar with the data by reading and re-reading transcripts and noting down initial ideas. This was followed by the second phase ‘generating initial codes’. Coding is a process of highlighting interesting features of the data and enables organisation of data into groups. The initial codes were then developed into potential themes and reviewed to ensure the themes worked in relation to the coded extracts during the third and fourth phases ‘searching for themes’ and ‘reviewing themes’. Themes were then ‘defined and named’. They were refined to ensure it was clear what the essence of each theme was about. The final phase was to select a number of extracts, relate back to the research questions and literature and ‘produce a report’ of the analysis. This procedure of thematic analysis was outlined by Braun and Clarke and was the approach adopted for analysis of the FG data, as it enabled the researcher to understand children’s health beliefs in relation to the research questions of this study i.e. do children hold CHBs across a number of health domains that have been associated with the onset of weight gain?

**4.3 Analysis**

The analytic approach resulted in identification of themes that reflect social and psychological issues surrounding children’s health beliefs. Three top level themes were identified, *‘General Health Beliefs’, ‘Compensatory Health Beliefs’* and *‘Influential Factors on CHBs’* (see Table 5). The first theme *‘General Health Beliefs’* identified a range of accurate and inaccurate beliefs children hold in relation to health protective and health risk behaviours. The second theme *‘Compensatory Health Beliefs’* identified a range of CHBs children hold in relation to health protective and health risk behaviours. The third theme *‘Influential Factors on CHBs’* identified a range of internal and external factors that could influence the construction of a CHB. The themes will be presented separately with themes 1 and 2 *‘General Health Beliefs’* and *‘Compensatory Health Beliefs’* presented first, followed by *‘Influential Factors on CHBs’*.

When reporting data from the focus groups, P followed by the number 1-35 to indicate the participant, FG followed by a number in the range of 1-6 will highlight which specific discussion the data was retrieved from, followed by gender, age and key stage (KS) group of the participant.

Children demonstrated a number of accurate, inaccurate and compensatory beliefs in relation to: activities including physical activity and sedentary behaviour; diet including food and drink; and routine including mealtimes, oral health, and sleep.

Most beliefs were discussed in relation to age-appropriate health behaviours such as fruit and vegetables, snacks and drink consumption, and screen time in terms of prolonged television viewing and computer use. Very few children mentioned behaviour such as smoking or alcohol consumption and as a result, comments in relation to the few older or adult-like behaviours will not be discussed as they are not representative of the FG discussions.

**Table 5.**

*Themes identified from focus group discussions (N=35)*

*First-Level Code Second-Level Code Third-Level Code Fourth Level Code*

1. General Health Beliefs

a. Accurate HBs I. Activities i. Physical activity

ii. Screen time

II. Diet i. Healthy

ii. Unhealthy

III. Routine i. Oral health behaviour

ii. Missing meals and sleep

b. Inaccurate HBs I. Activities

II. Diet

III. Routine

1. Compensatory Health Beliefs

a. Activities I. Inactivity

b. Diet I. Fruit and vegetables

II. Lack of health protective behaviour

III. Excess of health risk behaviour

IV. Neutralise diet

c. Routine I. Missing meals

II. Oral health behaviour

III. Sleep

1. Influential Factors on CHBs

a. Internal I. Food Categorisation i. Compensatory properties

ii. Quantifying properties

II. Developing complexity i. Differences

ii. Similarities

iii. Moral reasoning

iv. Not all children hold CHBs

III. Self-regulation i. Modify behaviour

ii. Personal experience

IV. Desire

V. Health Goals

b. External I. Family i. Parents

ii. Siblings and extended

II Social i. Peers

ii. School

iii. Media

1. General Health Beliefs

This theme will explore children’s knowledge in terms of accurate and inaccurate health beliefs. The complexity of children’s understanding of health is apparent as children identify accurate health beliefs in relation to activity, diet and aspects of their routine in relation to meal times and sleep. The data also demonstrates inaccurate health beliefs in relation to the same health domains including activity, diet and oral preventive behaviour. These beliefs will be outlined below and discussed in terms of the implications this has for a healthy lifestyle.

*1.a Accurate Health Beliefs (AHBs)*

AHBs were apparent in the data in relation to activities, diet and routine. Children identified the importance of physical activity and the need to avoid sedentary behaviour. A diet high in fruit and vegetables and low in sugar and fat, and the importance of brushing teeth daily, not missing meals and sleeping regularly were also accurate. These will be explored further in the following section in terms of the implications these have for a healthy lifestyle.

*1.a.I Accurate Health Beliefs – Activities*

Children in this study accurately identified the importance of daily physical activity, which includes the need to achieve moderate to vigorous levels of intensity for optimal health. They also identified the importance of minimising sedentary behaviour and a range of negative consequences resulting from prolonged screen time.

***1.a.I.i Physical activity is a daily requirement***

A number of guidelines have been stipulated by the Department of Health in relation to lifestyle-related behaviours in order to promote optimal health. These include physical activity guidelines for children aged 5-18 years which recommend: engaging in vigorous intensity activities, including those that strengthen the muscle and bone, at least three days a week; moderate to vigorous intensity physical activity for at least 60 minutes and up to several hours every day; and all children and young people should minimise the amount of time spent being sedentary (sitting) for extended periods (Chief Medical Officer, 2011).

Children understood the importance of physical activity in terms of exercise as a daily requirement:

*“… it’s not ok to not exercise”* (P2, FG1, M, Age 8, KS2)

However, they specified occasions when physical activity may not be possible or necessary. These tend to represent non-typical days such as special occasions or during periods of illness:

*“my birthday”* (P4, FG1, M, Age 7, KS2)

*“…poorly…”* (P3, FG1, F, Age 8, KS2)

Physical activity is defined as *“any bodily movement produced by skeletal muscles that results in energy expenditure”* (p.128, Caspersen, Powell & Christenson, 1985). ‘Exercise’ is a sub-set of physical activity and involves a planned, structured, repetitive bodily movement that is engaged in for the purpose of improving health (Waumsley & Mutrie, 2011). The data indicates children correctly defined activities requiring sufficient levels of movement as constituting exercise. The following quote is an example of very a young child’s ability to understand that movement alone is insufficient for optimal health when discussing his beliefs on whether or not playing his DS, a handheld games console, involved sufficient levels of activity to constitute exercise:

*“… one time I thought it was strong cos I was moving my arm but it was only tiny so I thought I couldn’t like I thought it wasn’t exercise…Cos I was only doing it tiny bit”* (P27, FG5, M, Age 5, KS1)

In line with the Chief Medical Officer’s (2011) guidelines, children recognise that a minimal amount of time should be spent being sedentary:

*“Sitting around playing on your computer and watching tele for a couple of hours…Because you’re not really moving…”* (P21, FG4, F, Age 9, KS2)

*“Bad…Because you’re not moving yourself you’re just sitting down watching tele.”* (P2, FG1, F, Age 8, KS2)

Children discuss ‘movement’ as a key concept when identifying healthy and unhealthy activities:

*“…As long as you’re doing something you’re healthy”* (P20, FG4, F, Age 10, KS2)

*“…a game that you can play all day and it keeps you healthy…Dance mat… you start moving onto the colours it tells you”* (P3, FG1, M, Age 8, KS2)

Children correctly identify a range of healthy and unhealthy activities based on the level of movement involved with the activity. Games such as ‘dance mat’ are correctly identified as having health benefits as it can increase caloric expenditure, heart rate, and coordination; psychosocial and cognitive impacts of interactive gaming may include increased self-esteem, social interaction, motivation, attention, and visual–spatial skills (Staiano & Calvert, 2011). As screen time and gaming is now a part of daily life (Hogan, 2012) it is encouraging that children correctly understand the importance of being active and the need to avoid sedentary behaviour. It is important to continue to promote these accurate beliefs as they are crucial for children’s physical and emotional development.

***1.a.I.ii Prolonged screen time causes weight gain and eyestrain***

Screen time has been found to have a dose-response association with a range of biomarkers for type 2 diabetes and cardiovascular disease (CVD) (Sigman, 2012) with increased screen time linked with higher risk factors. Whilst there are no official Department of Health guidelines for screen-time, a two-hour limit has been identified as a guideline in health literature in order to reduce the risk of psychological difficulties such as emotional, peer, concentration, and conduct problems (Sigman, 2012; Page, Cooper, Griew & Jago, 2010). Sigman (2012) recommends up to one hour of screen time for children aged 3-12 years to avoid significant biological changes in their bodies that may lead to weight gain.

Children in this study identified weight gain as a negative consequences of inactivity resulting from prolonged screen time:

*“You build up fat in your body”* (P2, FG1,M, Age 8, KS2)

*“…if you don’t use your legs your legs won’t get that healthy…”* (P33, FG6, M, Age 9, KS2)

These are accurate beliefs as the link between television viewing and weight gain is widely discussed in the literature. Cross-sectional studies have identified an association between the amounts of time spent watching television and obesity. This association was identified many years ago as Dietz and Gortmaker (1985) identified a 2% increase in the prevalence of obesity for each additional hour per day of television viewing in children aged 12 to 17 years. More recent studies have confirmed this association. Jackson, Djafarian, Stewart and Speakman (2009) found that each extra hour of watching TV was associated with an extra 1kg of body fat in preschool children. Davison, Marshall and Birch (2006) found that girls who viewed more than two hours of television per day were nearly five times as likely to become overweight by age 11 than girls who viewed fewer hours of television.

Children also identified eyestrain as a negative consequence of prolonged screen time:

*“If you watch it too much then, then it will make your eyes ache and hurt and then your eyes will go all wonky…”* (P13, FG3, 7, KS1) *“…And red”* (P16, FG3, M, Age 6, KS1)

Eyestrain resulting from prolonged screen time could be understood in terms of interference with the development of brain and cognition, whereby attentional problems and the speed with which screen material is presented can cause problems with executive function, which has been identified in a range of age groups in previous studies (Sigman, 2012).

It is a positive indication that children are aware of the negative effects of prolonged screen time on health. If children are aware of the negative outcome of prolonged screen time, they are more likely to develop beliefs that will promote a healthy lifestyle. According to the Theory of Reasoned Action (Ajzen & Fishbein, 1980) and Theory of Planned Behaviour (Ajzen, 1991) attitudes represent a positive or negative evaluation towards a particular behaviour which can inform one’s intention to perform a particular behaviour. Behavioural beliefs of prolonged screen time such as weight gain or a negative impact on eyes may reduce children’s intention to perform this behaviour.

Children’s accurate beliefs in relation to physical activity and reduced sedentary behaviour and prolonged screen time is a positive indication that they are likely to develop behavioural beliefs in relation to health protective behaviour and avoid engaging in health-risk behaviour based on correct knowledge.

*1.a.II Accurate Health Beliefs (AHBs): Diet*

Children hold AHBs in relation to diet. They correctly identify a diet high in fruit and vegetables and low in sugar and fat is healthy, along with accurate positive and negative consequences of consuming these dietary items.

***1.a.II.i A healthy diet comprises of fruit, vegetables, water and milk***

Children correctly responded *“Five a day”* when asked how many portions of fruit and vegetables should be consumed per day. The importance of fruit and vegetable consumption was explained:

*“[Lack of daily fruit and vegetable consumption]* *It’s not ok cos you won’t get strong and healthy…It’s because when you eat fruit you get even stronger and healthier”* (P17, FG3, F, Age 6, KS1)

Children also recognise that fruit consumption could be obtained in various forms including fruit juice:

*“[orange juice]… because orange is a fruit”* (P11, FG2, F, Age 6, KS1)

Research has shown that children who eat a diet rich in fruit and vegetables are less likely to become obese, are protected against different types of cancers, coronary heart disease, diabetes and cancer than children who do not include daily fruit and vegetable consumption as part of their diet (Erjavec, Viktor, Horne & Lowe, 2012). Children’s AHBs of the importance of fruit and vegetable consumption is indicative of a successful Department of Health ‘Five-a-day’ campaign which promotes daily fruit and vegetable consumption. This is positive as one of the strongest determinants of fruit and vegetable intake amongst adults is the extent to which they consumed fruit and vegetables as children (Krebs-Smith et al., 1996).

Children also correctly identified healthy drinks due to purity or protective factors:

*“[Water] Because it hasn’t got no fat in it or no sugar it’s just clean”* (P19, FG4, F, Age 10, KS2)

*“[Milk] because they’ve got calcium in them for your teeth”* (P5, FG1, F, Age 8, KS2)

The nutritional value of drinks informed the belief that they were healthy. These accurate beliefs are an important step towards encouraging children to engage in accurate health protective behaviours as research has found consumption of healthy beverages reduces the risk that soft drinks high in sugar will replace nutritious beverages (Harnack, Stang & Story, 1999) particularly as there is a strong evidence base which links sugar-sweetened beverage intake to obesity in children and adults (Patel & Ritchie, 2013).

***1.a.II.ii A diet high in sugar and fat is unhealthy***

The data demonstrates children’s awareness that there is little nutritional value in food containing high-sugar and high-fat content. A range of negative consequences relating to oral health and increased risk of illness were correctly identified particularly in relation to a high-sugar diet.

Unhealthy dietary items that were identified due to the sugar content include:

*“Sweets…chocolate, teas cos they have sugar in them…”* (P14, FG3, M, Age 6, KS1)

*“Tea cos it’s got sugar cubes in”* (P30, FG6, M, Age 9, KS2)

Coke was identified as an unhealthy drink due to its sugar content:

*“[coke] because they’ve got loads of fat and got sugar in them…”* (P4, FG1, M, Age 7, KS2)

Consumption of one fizzy drink per day increases children’s risk of obesity (Gavin, 2008) and children correctly identified the negative consequences of a high-sugar diet with weight gain and negative oral health consequences:

*“[coke]…get fat”* (P4, FG1, M, Age 8, KS2)

*“…coke is bad for you because it’s so bad for you, for your teeth. It might make them go black or brown if you don’t brush…your teeth*” (P11, FG2, F, Age 6, KS1)

Children’s beliefs that sugar has a negative effect on oral health and can cause weight gain is correct as sugar is high in calories and can lead to weight gain, tooth decay and heart disease (WHO, 2003).

All KS1 and KS2 children identified sugar as the key causal factor of weight. KS2 children, however, identified a wider range of unhealthy meals and attributed this to the fat and salt content:

“*Bacon…”* (P22, FG4, M, Age 9, KS2)

*“…fast food [McDonalds”* (P1, FG1, F, Age 8, KS2) because*“…it’s got loads of fat and salt in it an’ that*” (P5, FG1, F, Age 8, KS2)

*“… lasagne is fat because it’s got loads of calories in”* (P33, FG6, M, Age 9, KS2)

Negative consequences resulting from a high-fat diet included increasingly biological explanations and an increased risk of illnesses:

*“[Junk food is unhealthy because] You get fat and you can get cancer”* (P4, FG1, M, Age 7, KS2)… *“Because they’ve got grease on it and you eat grease an’ that”* (P5, FG1, F, Age 8, KS2)

*“If you eat too much fat you can come out with type two diabetes and what’s that, cancer”* (P21, FG4, F, Age 9, KS2)

*“But when if you, you gonna get loads and loads of fat in your body and you just, it like blocks up and your lungs in your body might close down on you and it’s not very nice”* (P32, FG6, F, Age 10, KS2)

The complexities of children’s increased understanding in relation to a high-fat diet, will be explained in more detail later in this chapter, when discussing influences on health beliefs based on developing complexities with age.

Children in both KS1 and KS2 identify a range of accurate, negative consequences of an unhealthy diet. If children engage in these unhealthy behaviours in the knowledge that there are negative consequences, this could be explained based on the concept of ‘unrealistic optimism’ (Weinstein, 1980) where they do not consider themselves at risk of harm and attribute the risk to others only. Alternatively, children could employ compensatory reasoning strategies to alleviate any conflict experienced when consuming food that is high in sugar and fat, in the knowledge that it may have negative consequences for their health. CHBs will be discussed in detail later in this chapter but it is important to recognise that children identify accurate outcome expectations of a high-sugar and high-fat diet.

These AHBs demonstrate that children understand a diet high in fruit and vegetables and low in sugar and fat is healthy, with positive and negative consequences of engaging in each of these, as health-protective or health-risky behaviours. As a result, children should be encouraged to translate these positive behavioural beliefs into healthy behaviour.

*1.a.III. Accurate Health Beliefs – Routine*

The aspects of routine that were explored include: oral health, meal times and sleep. A fewer, but comparable number of KS1 and KS2 children discussed beliefs in relation to routine with two KS1 and two KS2 groups discussing this topic. This was due to time constraints and a more detailed discussion in relation to diet and activity in the groups that did not discuss beliefs in this health domain. Nonetheless, AHBs were identified in relation to behaviours involved in children’s daily routines, demonstrating an awareness of correct oral health behaviour in relation to brushing teeth and negative physiological consequences of missing meals and sleeping late.

***1.a.III.i Oral Health Behaviour***

Oral preventive behaviour is identified as consisting of motor behaviour, health knowledge and cognitions about risk factors and good nutrition (Makuch & Reschke, 2001). From a young age children are aware of negative consequences that can result from not brushing teeth, particularly in relation to sweet consumption:

“*It’s a bad thing… Cos if you have sweets and you never brush them all the bugs will go on them”* (P11, FG2, F, Age6, KS1)

*“…they’ll all drop out… And if your teeth fall out two times…then you don’t grow ‘em back, two that one and that one and that one and that one fall out on me again I’m not having them, I won’t have another one there”* (P35, FG6, F, Age 9, KS2)

In addition to negative consequences of not brushing teeth, children identify the correct process and technique involved in brushing teeth in order to keep them clean:

*“I, I brush my teeth…I do it twice a day…I brush it forwards in the middles and back…To make em clean …and sparkly”* (P11, FG2, F, Age 6, KS1)

Children’s AHBs in relation to oral preventive behaviour suggests they are more likely to develop stable oral health behaviour patterns early in life which can be strong enough to withstand the influence of negative living conditions (Makuch & Reschke, 2001) such as regular access and availability of sweets.

***1.a.III.ii Missing Meals and Sleep***

Children identified negative physiological consequences of missing a meal and sleeping late and correctly identify these as unhealthy activities. Sleep was identified as having positive health benefits and could be distinguished from sedentary behaviour which also involves minimal levels of movement.

The negative physiological consequences of missing meals were identified as:

*“If you miss your breakfast you feel tired because your breakfast always wakes you up”* (P22, FG4, M, Age 9, KS2)

*“[If you miss a meal] You’d get hungry”* (P3, FG1, F, Age 8, KS2)

These are accurate health beliefs as breakfast helps to stabilize blood sugar levels and consequently skipping breakfast can lead to tiredness and lack of concentration (NHS, 2007) which can prevent children from participating in sporting activities. Missing breakfast can also cause metabolism to be sluggish and store more fat and as a result eating breakfast is associated with better weight management (Rodearmel et al., 2006).

The negative physiological consequence of sleeping late was identified as:

*“Bad*… *Because you get tired during the day”* (P4, FG1, M, Age 7, KS2) [sleep]

*“If you go to bed really really really really really really really really really really really really really really really really really late if you stay up then up all night until the morning then you’ll fell really tired”* (P17, FG3, F, Age 6, KS1)

Children’s beliefs in relation to insufficient sleep were accurate. Sleeping late incurs ‘sleep debt’ which is the effect of not getting enough sleep and can cause mental and physical fatigue (Nguyen-Duc, 2006). Insufficient sleep is also associated with weight gain. Chaput, Brunet and Tremblay (2006) identified the increase in prevalence of obesity over the same period of time as the progressive decrease in self-reported sleep duration with a dose-response relationship between short sleeping hours and an increased risk for overweight and obesity in children. In a later study they found short sleep duration was positively associated with abdominal adiposity in children (Chaput & Tremblay, 2007).

In addition to negative consequences, sleep was also identified as having positive health benefits:

*“Because you need sleep to get healthy and stuff cos you don’t just have to move around you can just lie down like go to sleep”* (P3, FG1, F, Age 8, KS2)

The distinction between sedentary behaviour and sleep is understood even though both activities involve minimal levels of movement. This demonstrates the varied nature of AHBs children hold in relation to sleep and indeed across a range of health-protective behaviours including brushing teeth, eating a healthy diet and engaging in sufficient levels of physical activity. Children also understand the need to avoid health risk behaviours including sedentary behaviour, prolonged screen time and a diet high in sugar and fat as they correctly identified a number of negative consequences.

These AHBs can inform positive and negative outcome expectations of behaviour which could inform children’s attitudes towards these behaviours. A positive favourable outcome of a behavioural belief will lead to an increased likelihood of the behaviour being performed and a negative outcome of the behavioural belief will reduce the likelihood of the behaviour being performed (Ajzen, 1991). Thus, it is important to ensure children hold AHBs in relation to health-protective behaviours that are perceived favourably such as, the benefits of sleeping is a healthy activity, and AHBs in relation to health risk behaviour identified negatively such as sweets have negative implications for oral health. This will increase the likelihood of children engaging in healthy lifestyle behaviours.

*1.b Inaccurate Health Beliefs (IHBs)*

IHBs were apparent in relation to physical activity, diet and routine. The data suggests a lack of understanding that physical activity was a daily requirement or what ‘five-a-day’ meant in behavioural terms, even though children correctly identified the catchphrase with ease. IHBs around sugar and brushing teeth were apparent with negative health implications for oral health based on these beliefs.

*1.b.I Inaccurate Health Beliefs – Activities*

Children’s beliefs continue to develop during childhood and it became apparent that in addition to AHBs, IHBs were also apparent in relation to physical activity. Physical activity was not identified as a daily requirement or that moderate to vigorous levels of intensity are required for optimal health benefits.

Physical activity guidelines differ for children and adults. Physical activity is a daily requirement for children with guidelines stipulating a minimum of 60 minutes of physical activity whereas guidelines for adults include a minimum of 150 minutes per week (Chief Medical Officer, 2011). Physical activity is a behaviour that both children and adults struggle to perform regularly (Health and Social Care Information Centre, 2014). Low levels of physical activity in children could be linked to an incorrect understanding of the requirement that physical activity is a daily requirement for children. The data from this study indicates children do not believe exercise is not a daily requirement:

*“Everyday [inaudible] is too much”* (P9, FG2, F, Age 6, KS1)

*“Yeah but then some days exercise*” (P23, FG4, M, Age 10, KS2)

These IHBs demonstrate the importance of ensuring health campaigns educate children that physical activity is a daily requirement as the data suggests children were unaware of this. The data also indicates children attribute wider health benefits to activities involving minimal levels of intensity on the basis that some movement was involved:

*“And you write, you’re writing that gives you exercise to your hand.”* (P8, FG2, M, Age 6, KS1)

*“Sometimes playing with cars can be healthy cos your you’re using your hands a lot”* (P23, FG4, M, Age 10, KS2)

These beliefs could be a barrier for children to engage in sufficient levels of physical activity. It is important to ensure children understand that physical activity is a daily requirement and also ensure it is clear what constitutes sufficient activity for optimal health. If children continue to hold such IHBs they may incorrectly engage in activities that are not of moderate to vigorous levels of intensity based on the incorrect belief that they have engaged in sufficient levels of physical activity.

*1.b.II Inaccurate Health Beliefs – Diet*

IHBs were apparent in relation to diet in terms of what constitutes ‘five-a-day’ and the healthy properties of fruit. Children also held IHBs for sugary snacks and the unhealthy consequences of a high-sugar diet.

Children correctly identified the ‘five-a-day’ catchphrase but when their reasoning of fruit and vegetables was explored further, a number of incorrect beliefs were apparent. ‘Five-a-day’ was identified as comprising five portions of fruit, children did not recognise that ‘five-a-day’ refers to a range of fruit, vegetables and pulses (Department of Health, 2005):

*“It’s like when you eat five a day, eat five fruits a day…”*  (P35, FG6, M, Age 8, KS2)

It is important to identify the limitations of children’s understanding to ensure health promotion campaigns are developmentally appropriate (Maddux, Roberts, Sledden & Wright, 1986) and to ensure correct knowledge is not assumed even when children offer a seemingly correct response such as ‘five-a-day’. In addition to beliefs around fruit, IHBs were evident in relation to the presence of sugar in dietary items and the consequences of sugar consumption. Children begin to understand that there are different types of sugar but incorrectly associate fruit with no sugar and sweets with natural sugar:

*“Because it is, that’s got no sugar in [fruit juice]”* (P25, FG5, F, Age 6, KS1)

*“Sweets can actually be healthy you know why…Because they’ve got natural sugar in them”* (P18, FG4, M, Age 9, KS2)

Sugar comes in many forms such as fructose which is found in fruit and lactose which is present in milk, but along with sugar, these dietary items also contain essential nutrients for the body and are low in fat and calories (NHS Choices, 2013b). Other types of sugar are not essential for the body and can cause weight gain (WHO, 2003). The latter quote demonstrates that children understand there are different types of sugar and associate natural sugar with healthy food. It is important to ensure children have a correct understanding that sugar content of sweets is quite often not natural sugar, rather it is added sugar with has no nutritional value, in order to minimise IHBs which may promote sweet consumption.

Although coke was accurately recognised as an unhealthy drink, the data indicates IHBs were also apparent as coke was identified as a healthy drink based on its sugar content:

*“…coke’s not unhealthy”* (P18, FG4, M, Age 9, KS2)

*“Coca cola is [healthy]”* (P26, FG5, M, Age 5, KS1)

*“Yeah but it’s got no sugar in cos its flat”* (P35, FG6, F, Age 9, KS2)

Children’s belief that there is no sugar in coke has negative health implications as a carbonated drink can include up to 10 teaspoons of sugar (WHO, 2003) including a can of coke. It is important to understand the basis of children’s beliefs and the healthy and unhealthy properties of food that they identify. This understanding can enable health professionals to develop health campaigns which challenge and correct these IHBs.

Children incorrectly identify severe negative consequences of a high-sugar diet:

*“It can kill you… Cos your teeth will get black”* (P30, FG6, M, Age 9, KS2)

*“Makes your lungs bad”* (P32, FG6, F, Age 10, KS2)

*“[lemonade] I think it’s unhealthy because it keeps coming down and makes like swizzle round quickly and it could go in your good part cos its going very quickly and it could go in your good part and that means you’ll be all blind. But that never happened to me though”* (P27, FG5, M, Age 5, KS1)

Sugar has been identified as a causal factor in weight gain (Foresight, 2007). Coke, along with a range of other carbonated drinks, includes high levels of sugar that can contribute to weight gain (Gavin, 2008). A high-sugar diet has not been linked to mortality rates and although an unhealthy diet is implicated as a risk factor for a number of illnesses such as certain cancers and type-two diabetes, it cannot cause blindness and internal organ failure. It is important children develop accurate beliefs as these beliefs influence their perception of risk (Weinstein, 1980) and intention to perform a behaviour (Ajzen, 1991), particularly as it might encourage them to engage in other health-risk behaviours resulting from a low perception of risk resulting from their experience with these unhealthy behaviours.

*1.b.III Inaccurate Health Beliefs – Routine*

One IHB was apparent for routine which is substantially low when compared with other health domains. This could have been due to time constraints as this was the final topic of discussion which limited the depth of discussion that was possible.

It cannot be assumed that children understand brushing teeth is a daily requirement as the data suggests this was not the case:

*“I never brush my teeth”* (P10, FG2, M, Age 6, KS1)

When this comment was explored further, it became apparent this child did not identify any negative health implications resulting from this behaviour as he replied *“Doesn’t matter.”*

This suggests his perception of risk of dental caries is low and this IHB may promote lack of engagement in a health protective behaviour such as brushing teeth. This highlights the importance of ensuring children’s behavioural beliefs are accurate as these beliefs inform their engagement with health risk and health protective behaviours based on their perception of risk or outcome expectancies.

Children’s IHBs in relation to what constitutes sufficient levels of engagement in physical activity to promote health and well-being, and an exploration of seemingly correct responses in relation to diet revealed a limited understanding in relation to these behaviours. It cannot be assumed that children understand what constitutes a healthy lifestyle, even when offering seemingly correct responses. Thus it is important to ensure that children’s incorrect beliefs are corrected and accurate beliefs are promoted to encourage participation in healthy lifestyle behaviours such as sufficient levels of physical activity, consumption of dietary items low in sugar and engaging in daily oral preventive behaviour.

The first theme *‘General Health Beliefs’* highlights children’s knowledge in relation to a healthy lifestyle. Accurate and inaccurate beliefs have been demonstrated in relation to the same health behaviour. This highlights the importance of ensuring accurate information is available and promoted throughout childhood as beliefs appear to develop over time, and although children offer the ‘correct response’ such as ‘five-a-day’, they do not always understand what this means for behaviour.

1. *Compensatory Health Beliefs (CHBs)*

Regardless of the accuracy of their health beliefs, the data confirmed that children construct CHBs to justify engaging in unhealthy behaviour. The following quote illustrates the process of compensation, with the order and sequencing of behaviour indicating that a healthy behaviour can be used to restore, balance or compensate for an unhealthy behaviour:

*“Cos if a apple, if a apple weren’t healthy you still could eat it but after if you’ve had an unhealthy snack you could have a healthy snack”* (P29, FG5, F, Age 5, KS1)

Children demonstrate compensatory reasoning across a range of health domains including activities, diet and routine. Key compensatory behaviours included fruit and vegetable consumption, physical activity and brushing teeth. As with the adult literature, children hold a combination of maladaptive, partially adaptive and adaptive CHBs (Rabiau, Knauper & Miquelon, 2006). The following section will outline CHBs children hold and the implications this has for a healthy lifestyle.

*2.a. Compensatory Health Beliefs: Activities*

Children identify a number of negative consequences of unhealthy activities which can be minimised or eliminated by engaging in a healthy behaviour. Inactivity resulting from prolonged screen time and sedentary behaviour were considered unhealthy and negative consequences include feeling stiff and experiencing eyestrain. A range of CHBs were identified based on fruit consumption, physical activity and sleep as compensatory behaviours.

***2.a.I Compensating for inactivity***

Children demonstrated awareness that prolonged screen time was an unhealthy activity and can cause negative physiological responses such as eyestrain. Compensatory behaviours included physical activity, fruit consumption and sleep as strategies to negate the negative consequences of prolonged screen time.

Running was identified as a key compensatory behaviour throughout the FGs. Children identify this as a strategy to resolve the negative effects of prolonged screen time:

*“Running around when you’ve been…on the computer”* (P4, FG1, M, Age 7, KS2)

*“If I watch tele, then my, when I sit down and when I get up again I feel all stiff an’ that…because I haven’t moved for quite a long time”* which could be negated *“…you could get up and go outside and go running places”* (P5, FG1, F, Age 8, KS2)

Risks associated with prolonged screen time extend beyond risk factors for weight gain to include eyestrain, neck and back pain and computer related syndromes such as cumulative trauma disorder (Mason, 2008). The CHB that running can minimise negative consequences of prolonged screen time is a partially adaptive belief as it can minimise some of the negative consequences but it is unclear if engaging in this type of CHB would eliminate all negative consequences including attentional problems associated with prolonged screen time (Page, Cooper, Griew & Jago, 2010). Rabiau, Knauper and Miquelon (2006) warn that it can be difficult to distinguish between an adaptive and maladaptive CHB as an unhealthy behaviour can have multiple effects and a compensatory behaviour may only eliminate one of the negative effects. This is known as a partially adaptive CHB but should still be avoided as some of the negative consequences of the unhealthy behaviour remain.

CHBs which identify compensating for inactivity based on fruit and vegetable consumption were also apparent. The following quote is a response to compensating for prolonged screen time:

*“Have some fruit”* (P11, FG2, F, Age 6, KS1)

Eating fruit was identified as a key compensatory behaviour throughout all of the FGs across a number of health domains. Fruit is perceived to have positive benefits and children demonstrate the belief that the health gains of fruit consumption can make up for prolonged screen time. This is a maladaptive belief as the vitamin and mineral content of fruit cannot compensate for the negative effects of inactivity or missing the health benefits of physical activity, which include muscle and bone strengthening activities. Engaging in this type of reasoning promotes sedentary behaviour and should be discouraged in children in order to minimise their risk of weight gain.

A range of negative consequences resulting from prolonged screen time were identified, including eyestrain. This experience of eyestrain is a well-documented feeling in children resulting from prolonged screen time(Mileham, 2008) and a compensatory strategy based on sleep was identified to resolve this negative consequence:

*“Go to sleep”* (P16, FG3, M, Age 6, KS1)

*“Go sleep…the computer strains your eyes and you get headaches…, well I do anyway”* (P20, FG4, F, Age 10, KS2)

This is a partially adaptive belief as sleep can minimise eyestrain but it cannot compensate for being sedentary for a prolonged period or for the lack of engagement in physical activity. As CHBs are associated with poorer health outcomes, this type of reasoning in children may have negative implications for children’s levels of physical activity and might promote prolonged screen time, each of which have been associated with the onset of overweight and obesity (Brown & Summerbell, 2009). Berli, Loretini, Radtke, Hornung and Scholz (2014) found CHBs were associated with lower intentions to be physically active in adolescents. Children may engage in similar reasoning and their use of CHBs could also be associated with lower intentions to be physically active. This could be as a result of identifying fruit and sleep as compensatory behaviours for prolonged screen time. CHBs in the current study which are based on physical activity could be partially adaptive if implemented behaviourally, however, as Rabiau, Knauper and Miquelon (2006) warn, CHBs are associated with poorer health outcomes as CHBs provides an immediate justification for an unhealthy behaviour and the compensatory behaviour may not be performed at a later date.

*2.b Compensatory Health Beliefs – Diet*

The data evidenced most children hold CHBs in relation to fruit and vegetable consumption, snacks, dinner and drinks. Fruit and vegetable consumption is used as a key compensatory behaviour for an unhealthy diet based on the belief that fruit and vegetables have fat-eliminating properties. Children construct CHBs in relation to diet in different ways. They identify CHBs to compensate for lack of engagement with a health protective behaviour, an understanding that in the absence of one health behaviour they can engage in another health protective behaviour to minimise the negative health outcome. CHBs were also identified in relation to an unhealthy diet which demonstrates an awareness that a different behaviour can compensate for actual behaviour engaged in. Children also identified CHBs in relation to neutralising risk of fizzy drink consumption with water. Children’s dietary CHBs were varied and will be discussed in more detail below.

***2.b.I Fruit and vegetable consumption is a key compensatory behaviour***

The data demonstrates that even in a simplistic form children were able to construct CHBs based on the belief that fruit and vegetables have fat eliminating properties. Children explained the negative consequences of a high-sugar and high-fat diet could be eliminated with fruit and vegetable consumption:

*“You could eat proper healthy stuff…like an apple…or something healthy”* (P17, FG2, F, Age 6, KS1) which was explained further by a child in the same group *“Cos then it makes all the fatness go away”* (P13, FG3, M, Age 7, KS1) [sweets]

*“They can have veg… If they eat bacon they could have, they could’ve had like some veg after that, some broccoli with carrots or something like that… Because even though fruit’s got vitamins, carrots and all that, veg has got vitamins as well and the vitamins make you all healthy and they make like the bad effects fade away…”* (P32, FG6, F, Age 10, KS2) [dinner]

Use of language such as ‘fade away’ supports operationalization of the adult definition of a CHB, which is defined as the belief that the negative effects of an unhealthy behaviour be neutralised by engaging in a healthy behaviour (Knauper, Rabiau, Cohen & Patriciu, 2004). Language used by children to explain CHBs, whilst stating a similar belief, is consistent with their age and language development.

The belief that fruit and vegetables have fat eliminating properties which can compensate for a high-sugar and high-fat diet demonstrates similar reasoning of children in the draw-and-talk study, outlined in chapter 3. More detail was provided in the draw-and-talk study due to the clinical interviewing technique adopted which was designed to cognitively exhaust children’s reasoning and achieve detailed explanations at the underlying cognitive level. However, use of a different interviewing technique identified similar reasoning in children which suggests CHBs are a wider, global construct that is apparent in lots of children.

***2.b.II Compensate for lack of one healthy activity with another healthy activity***

Children identified three health-protective compensatory behaviours in relation to diet. These were: fruit and vegetable consumption, physical activity and brushing teeth. When discussing compensations for lack of fruit and vegetable consumption, children identified physical activity as a compensatory behaviour. When discussing lack of physical activity, children identified fruit and vegetable consumption as a compensatory behaviour:

*“Do a lot of swimming and running and stuff… Cos it burns off calories”* (P22, FG4, M, Age 9, KS2) [lack of fruit and vegetables]

*“Just if you don’t get to exercise just eat healthy things… you get, your bones get all strong then you get to pick heavy stuff up and then you get then you get really stronger and taller”* (P25, FG5, F, Age 6, KS1)

Brushing teeth was also identified as a compensatory behaviour based on the underlying belief:

*“…If you don’t eat fruit and vegetables it’ll make your teeth go all brown”* (P11, FG2, F, Age 6, KS1) [brushing teeth as CHB]

These are maladaptive CHBs as the health benefits achieved from eating fruit and vegetables cannot be achieved from physical activity or brushing teeth. The use of CHBs in children should be discouraged particularly in relation to compensating for lack of engagement of one health-protective behaviour with another health-protective behaviour. This type of reasoning has negative health implications as it will result in the absence of engaging in health protective behaviour which is essential for good health such as running, brushing teeth or fruit and vegetable consumption, each of which is important to engage with on a daily basis.

***2.b.III Compensate for excess of high-sugar and high-fat diet***

The negative consequences of an unhealthy diet were explained in terms of oral health and weight gain. Children explain the negative consequence of eating sweets in terms of oral health and identify brushing teeth as a compensatory behaviour. In addition to these beliefs, children identify physical activity as a compensatory behaviour to eliminate the negative effects of a high-fat and high-sugar diet.

A negative consequence of sweet consumption was identified as a build-up of plaque:

*“…if you eat sweets it won’t make you healthy and if you brush your teeth after you’ve eat sweets then your teeth won’t get plaque on them…”* (P35, FG6, F, Age 9, KS2)

Another child added to this comment, stating *“And midday sometimes”* (P31, FG6, M, Age 8, KS2) suggesting that brushing teeth in addition to the recommended daily guidelines would eliminate the negative effects of eating sweets. This is a partially adaptive belief as brushing teeth can minimise plaque build-up but sweets lack beneficial nutrients and are full of saturated fat and added sugar, and regular consumption could increase children’s risk of diabetes and tooth decay (Willett, 2014). Brushing teeth cannot compensate for these negative effects and instead of constructing CHBs, children should be discouraged from eating lots of sweets.

CHBs based on physical activity in relation to unhealthy snacks and fizzy drink consumption were identified:

*“…you could go outside and run around…it’ll burn out calories”* (P23, FG4, M, Age 10, KS2) [fizzy drink]

*“Eat something healthy or running around”* (P22, FG4, M, Age 9, KS2) in order to *“Burn off calories”* (P23, FG4, M, Age 10, KS2)

Studies have identified a higher intake of sugar sweetened beverages is linked to weight gain (Gavin, 2008) and reducing consumption of sugar sweetened beverages decreases weight gain in children (Hu, 2013). Further risks associated with fizzy drink consumption were identified by Yoshida et al. (2007) who found that consumption of two or more fizzy drinks a day may be associated with insulin resistance, a precursor to type 2 diabetes. This suggests the wider risks of fizzy drink consumption cannot be compensated for with physical activity. The belief that running will compensate for unhealthy snacks is partially accurate as the benefits of physical activity include controlling body fat (Dugan, 2008). This suggests that compensatory behaviours such as running may remove partial ill-effects of both unhealthy snacks and fizzy drinks by expending additional calories consumed but it may not lower the risk of obesity or insulin resistance. Furthermore if compensatory behaviours are not followed through, the likelihood of weight gain is increased.

***2.b.IV Neutralise coke consumption with water***

The data indicates coke was identified as an unhealthy drink with a wide range of negative consequences based on oral health and weight gain. Water was identified as a key compensatory behaviour and was discussed in terms of ‘washing’ the coke down, indicating water as a compensatory behaviour neutralised the unhealthy effects of drinking coke.

CHBs based on water and coke consumption include:

*“If you have something to drink that’s healthy after [coke]...like water…It will wash it down…”* (P12, FG2, F, Age 6, KS1)

*“After every coke I have two drinks of water, two bottles”* (P33, FG6, M, Age 9, KS2)

*“It [water] like flushes all the fizz out”* (P20, FG4, F, Age 10, KS2)

This type of reasoning has negative implications for long-term health. If children engage in this type of reasoning to justify coke consumption, they would be at at increased risk of weight gain and dental caries as water cannot neutralise the negative effects of coke consumption.

Use of CHBs for dietary behaviour has been associated with poorer health. Taut and Baban (2008) found a positive association between CHBs and nutrition style in coronary heart disease patients with the activation of CHBs related to excessive salt, fat and sugar consumption. This was explained based on the necessity of changing dietary patterns and failures in self-regulation resulting in activation of CHBs. The use of diet-specific CHBs results in greater caloric intake in dieters (Kronick, Auerbach, Stich & Knauper, 2011) and is associated with poor adherence to health behaviour among adolescents (Rabiau, Knauper & Miquelon, 2006). It is therefore more appropriate to discourage use of diet-specific CHBs as a regulatory strategy and encourage children to resist unhealthy temptations by challenging and correcting maladaptive beliefs.

*2.c. Compensatory Health Beliefs - Routine*

Children’s CHBs were explored in relation to aspects of their routine including missing meals, brushing teeth and sleep. Children held fewer CHBs for each of these behaviours compared with other health domains such as activity and diet. This could be because these behaviours tend to be regulated by parents such as meal times (Wardle, Carnell & Cooke, 2005) and children do not have the opportunity to self-regulate sleep patterns and oral health behaviour in comparison to diet and activity.

***2.c.I Compensatory Health Beliefs – Routine: missing meals***

CHBs in relation to missing meals were discussed in terms of increasing quantity of food in order to compensate for missing a meal earlier in the day. The key meal that children discussed in relation to this topic was breakfast. This could be due to the fact that children have increased opportunities in their environment to prepare this meal as, depending on the type of breakfast, fewer skills are required to prepare it e.g. cereal.

Compensations for missing a meal were discussed in terms of increasing food consumption later in the day:

*“Eat a long dinner”* (P30, FG6, M, Age 9, KS2)

*“If you have loads of it, if you don’t have any breakfast that means it’ll make you so good. Sometimes I have two fruit a day at break times at school*” (P11, FG2, F, Age 6, KS1)

These beliefs are similar to a CHB included in the adult scale which states *“It is OK to skip breakfast if one eats more during lunch or dinner”* (Knauper, Rabiau, Cohen & Patriciu, 2004, p. 613). Whilst children demonstrate similar compensatory reasoning, their language to explain this belief is qualitatively different to that of adults. This suggests that CHBs in relation to food consumption which are apparent in adulthood may have formed during childhood, such as, the belief that it is ok to miss breakfast if more food is consumed later in the day to make up for it. Addressing these beliefs in childhood could minimise the strength of compensatory reasoning in adulthood and promote a healthier eating routine in children and adults from an early age.

***2.c.II. Compensatory Health Beliefs – Routine: oral health***

Brushing teeth was identified as a key compensatory behaviour to minimise or neutralise the negative consequences of an unhealthy diet, as outlined earlier. Children also identify CHBs in relation to not brushing teeth based on increasing the number of times they will brush teeth at a later date and using mouthwash, as compensatory behaviours.

CHBs in relation to not brushing teeth were based on the following compensatory behaviours:

*“Mouthwash”* (P7, FG2, M, Age 6, KS1)

*“Water”* (P12, FG2, F, Age 6, KS1)

*“Brush them really good… Brush them twice in the morning and twice at night and in the morning and another night”* (P8, FG2, M, Age 6, KS1)

*“If you don’t brush your teeth if you don’t want to brush your teeth there’s like these chewing gums like brush when you put them in your mouth they don’t do anything but they make your er your mouth teeth go fresh an’ that and they look clean”* (P5, FG1, F, Age 8, KS2)

The key term in the latter quote is *“if you don’t want to”* which highlights the fact that children recognise engaging in a health protective behaviour such as brushing teeth is within their control and a conscious decision is made to engage in it or not.

Identifying the use of mouthwash or increasing the number of times brushing teeth is performed as compensatory behaviours demonstrates maladaptive reasoning. Tooth decay is one of the most widespread health problems in the UK with more than one in four children having some degree of tooth decay (NHS Choices, 2014). It could be that children engage in maladaptive compensatory reasoning in relation to oral health, thus increasing their risk of tooth decay, which suggests this reasoning needs to be corrected or discouraged from use.

***2.c.III Compensatory Health Beliefs – Routine: sleep***

Fewer CHBs in relation to sleep were identified with the negative consequences of this behaviour explained in terms of feeling tired. Sleeping late incurs ‘sleep debt’ which is the effect of not getting enough sleep and can cause mental and physical fatigue (Nguyen-Duc, 2006). In addition to mental and physical fatigue, short-term sleep restriction is associated with weight gain via changes in hunger hormones (Marshall, Glozier & Grunstein, 2008).

Children identified CHBs for sleeping late by sleeping for longer periods of time to compensate for the negative consequences of feeling tired:

*“Sleep in’t day”* (P21, FG4, F, Age 9, KS2)

*“...on Saturday ...You could have a lie in...It gives me more time to sleep”* (P20, FG4, F, Age 10, KS2)

Children aged between five and twelve years are advised to get between 9 - 11 hours sleep (Nguyen-Duc, 2006). If children sleep late at weekends or wake up later the following day to obtain 9-11 hours sleep, they may not be at risk of sleep debt or weight gain and this could be considered an adaptive CHB if engaged in short-term to avoid prolonged changes to hunger hormones. However, if children sleep late and get insufficient sleep they are at increased risk of sleep debt and weight gain.

The CHBs children identified in relation to sleep are similar to the CHBs included in the adult scale: *“Too little sleep during the week can be compensated for by sleeping in on the weekends*” and *“It is OK to go to bed late if one can sleep longer the next morning (only the number of hours count)”* (Knauper, Rabiau, Cohen & Patriciu, 2004, p. 613). As this is the first exploration of children’s compensatory reasoning, it could be worth exploring the developmental trends of CHBs that exist in childhood and adulthood to understand the process of compensatory reasoning more fully.

The data demonstrates children hold CHBs across a number of health domains which are, at times, consistent with adult compensatory reasoning. The CHBs identified in this study are largely maladaptive. That is, they are constructed using behaviour that cannot effectively compensate for the negative consequences of an unhealthy behaviour. An example of a maladaptive CHB is the belief that fruit and vegetable consumption can compensate for prolonged screen time. The vitamins and minerals in fruit and vegetables cannot neutralise the negative effects of inactivity and tired eyes. Partially adaptive CHBs are those that can compensate for some of the negative consequences of unhealthy behaviour. CHBs which involve running as a compensatory behaviour for inactivity resulting from screen time is partially adaptive as it can minimise the negative effects of inactivity but cannot make up for eyestrain. In line with previous research on CHBs in adolescents and adults (Rabiau, Knauper & Miquelon, 2006; and Berli, Loretini, Radtke, Hornung & Scholz, 2014), there were not many adaptive CHBs apparent in this study. Adaptive CHBs include compensatory behaviours that can effectively neutralise the negative effects of an unhealthy behaviour. A CHB which includes running as a compensatory behaviour for a high-fat diet could be considered adaptive if the activity was of a sufficient distance and duration and fat consumption was minimal. According to the adult model, in order for the compensatory behaviour to be performed, activation of implementation intentions will be required (Knauper, Rabiau, Cohen & Patriciu, 2004). Although children are capable of the if-then thinking that is required to develop implementation intentions, they do not usually make these plans on their own (Wieber, von Suchodoletz, Heikamp, Trommsforr & Gollwitzer, 2011). Therefore children will need to be supported to develop appropriate implementation intentions required to perform the compensatory behaviour. CHBs are associated with poorer health outcomes as individuals may fail to follow through with their implementation intentions (Knauper et al.). It is therefore more appropriate to challenge maladaptive CHBs and discourage the use of compensatory reasoning in children. Engaging in such beliefs may interfere with making healthy choices required to engage in a healthy lifestyle and should be discouraged from use.

The first aim of this study was to explore children’s beliefs specifically in relation to CHBs for healthy lifestyle behaviours. Theme 1 *‘General Health Beliefs’* identified a range of accurate and inaccurate beliefs children hold in relation to activity, diet and routine. Theme 2 *‘Compensatory Health Beliefs’* evidenced that children hold a range of CHBs in relation to activity, diet and routine which are largely maladaptive, and to a lesser extent partially adaptive and adaptive. The second aim of the study was to consider the influences on children’s CHBs. A number of internal and external factors influence the construction of CHBs in children and will be discussed in the following section outlining the third theme *‘Influential Factors on CHBs’* (see Table 6).

**Table 6.**  *Theme 3 ‘Influential Factors on CHBs’*

*First-Level Code Second-Level Code Third-Level Code Fourth level code*

3) Influential Factors on CHBs

a. Internal I. Food Categorisation i. Compensatory properties

ii. Quantifying properties

II. Developing complexity i. Differences

ii. Similarities

iii. Moral reasoning

iv. Not all children hold CHBs

III. Self-regulation i. Modify behaviour

ii. Personal experience

IV. Desire

V. Health Goals

b. External I. Family i. Parents

ii. Siblings and extended

II Social i. Peers

ii. School

iii. Media

*3. Influential Factors on CHBs*

A number of internal and external factors influence the construction of a CHB. Internal influences involved in the process of constructing a CHB include: reasoning strategies associated with categorising food (Oakes, 2005); developing complexities of CHBs based on children’s age and their experience with the environment; this informs their ability to self-regulate (Bandura, 1997) and develop CHBs when faced with unhealthy but desirable behavioural choices. Other internal factors include the experience of temptation or desire and holding health goals which may influence the construction of a CHB. External factors which may influence the development of a CHB include: family influences of parents, siblings and extended family; and social influences of peers, school and media. Children’s knowledge and beliefs are informed by their experience with the external environment and includes observing role models engaging in healthy and unhealthy behaviour which inform outcome expectations of behaviour.

*3.a. Internal factors*

Internal factors which influence the construction of a CHB includes food categorisation as a process which identifies the fat eliminating properties of food. Children engage in this process in order to identify compensatory behaviours which are then used to construct a CHB. Developing complexities of CHBs were apparent with age as younger children offered more simplistic explanations and identified fewer CHBs than older children. A range of self-regulatory strategies were identified based on children’s positive and negative experiences of engaging in healthy and unhealthy behaviour. These experiences inform the construction of a CHB as children identify compensatory behaviours based on activities within their control that they have access to and experience of performing. Experience of the hedonic drive or temptation to engage in unhealthy behaviours and health goals were also apparent. These are important processes in the adult CHB model as CHBs are activated when a conflict occurs between an internal desire to engage in an unhealthy behaviour which interferes with achieving one’s health goals (Knauper, Rabiau, Cohen & Patriciu, 2004). Each of these internal processes and drives can influence the construction of a CHB and will be discussed in more detail below.

*3.a.I Food Categorisation*

Children employ a number of reasoning strategies when constructing a CHB. These include identifying functional attributes of food to have fat eliminating properties and quantifying behaviour. These reasoning strategies were employed to inform the development of appropriate compensatory behaviours.

***3.a.I.i Compensatory properties of food and water***

The bases of food attitudes can be either affective or cognitive (Cervellon & Dube, 2005). Affective origins relate to feelings and emotions experienced in response to food whereas cognitive bases contain positive and negative attributes and consequences of a more functional nature such as nutritional value or health consequence (Cervellon & Dube). Children in this study identify the cognitive bases of fruit in terms of its fat-eliminating function:

*“Cos then it makes all the fatness go away”* (P13, FG3, M, Age 7, KS1)

*“Just, just eat five a day, I would…because it helps you, it helps get all the bad things away [in fizzy drinks].”* (P33, FG6, M, Age 9, KS2)

The belief that fruit has fat eliminating properties was also identified in the draw and talk study (chapter 3). The data indicates children categorise the function of fruit as having the ability to eliminate fat. These underlying beliefs about fruit could inform the construction of a CHB when seeking a healthy behaviour that is capable of compensations. The adult literature identifies the importance of self-efficacy when activating CHBs, that is, when the individual’s perception of their own capability to perform behaviour is high, they are more likely to generate a CHB (Rabiau, Knauper & Miquelon, 2006). Prior to considering their own capabilities, children appear to generate CHBs based on their perception of fruit having fat-eliminating, compensatory properties. Consistent reasoning was demonstrated in relation to fruit and vegetables compensating for wider dietary behaviours such as fizzy drink consumption.

Water was also consistently categorised as a healthy drink. It was identified as capable of removing acid from teeth resulting from fizzy drink consumption:

*“I drink enough water…it helps you…Gets all the acid out your teeth…Because it doesn’t taste like really sweet and sugary, it tastes really nice, it tastes really, it doesn’t taste of nothing but it’s healthy because, I know this is a bit stupid saying but it’s got like some little vitims, vitamins in them…”* (P32, FG6, F, Age 10, KS2)

*“Because it [water] hasn’t got no fat in it or sugar, it’s just clean.”* (P19, FG4, F, Age 10, KS2)

Identifying the vitamin and mineral content of dietary items increases its perception as wholesome (Oakes, 2005). Such beliefs may inform the construction of a CHB as children believe these essential nutrients can remove harmful ingredients in unhealthy drinks. The perception of water containing no fat and sugar categorises this as a healthy activity and such beliefs appear to inform the construction of a CHB with water identified as compensating for fizzy drink consumption. Thus, children identify positive attributes and functions of food based on the perception of their underlying properties.

***3.a.I.ii Children quantify healthy and unhealthy properties of food and activity***

Quantifying behaviour in terms of the number of occurrences or quantifying healthy and unhealthy properties of an activity appears to be an underlying strategy that informs the development of a CHB.

Increasing the number of times a healthy behaviour is performed was identified as compensating for a high-sugar diet. This can be illustrated by the following beliefs that brushing teeth or running a particular distance has compensatory capabilities to eliminate the additional sugar consumed:

*“…midday sometimes”* (P31, FG6, M, Age 8, KS2) [brushing teeth and sweets]

*“… just run around the block twice”* (P19, FG4, F, Age 10, KS2) [fizzy drinks]

Variations on this type of reasoning included increasing the quantity of food when compensating for an unhealthy diet:

“*Get rid of it [acid and sugar]…but you’d probably need quite a bit of it [water]…there’s a lot of bad stuff in it”* (P22, FG4, M, Age 9, KS2) [fizzy drinks]

Understanding these strategies offers an insight into how children construct CHBs at the underlying level based on reasoning processes which identify appropriate compensatory behaviours. These beliefs can form the basis of health promotion campaigns which can challenge and discourage the use of maladaptive CHBs by encouraging children to correctly quantify the healthy and unhealthy properties of each of these activities, thus illustrating their maladaptive reasoning of a compensatory behaviour.

Health beliefs concerning the value of different food tends to be categorised as either extremely good or bad for health and leads to stereotypical thinking in relation to diet (Oakes, 2005). A food’s stereotypic healthiness is often reduced when additional ingredients such as sugar, salt or fat are added (Oakes) and this was apparent in children’s reasoning in relation to certain food items that were perceived as ‘good’ and ‘bad’. This was illustrated during children’s discussions around cheese and onion crisps. This discussion occurred, unprompted, during both KS1 and KS2 discussions. KS1 children identified cheese and onion crisps as a healthy snack based on categorisation of vegetables as a key, healthy ingredient:

*“Sweets are not healthy for you but crisps are kind of healthy for you…because they haven’t got any sugar in, they’re made out of…only cheese and onion. They’re made out of healthy stuff”* (P25, FG5, F, Age 6, KS1)

*“Yeah because they’re made from potatoes”* (P24, FG5, F, Age 5, KS1)

KS2 children discussed the same snack but were in disagreement about whether or not this was a healthy or unhealthy snack due to the presence of both healthy and unhealthy ingredients:

*“Cheese and onion Walkers are healthy because they’ve got onions and cheese…First the onion’s a vegetable, second cheese has milk in what makes your bones strong.”* (P31, FG6, M, Age 8, KS2)

This was contested by a child in the group as she identified cheese and onion as flavouring but argued there was a different ingredient in crisps that was healthy:

*“No, it just makes the taste…but there’s some healthy about crisps because potatoes, crisps are made out of potato”* (P32, FG6, F, Age 10, KS2)

*“But they’ve still got a bit of salt in haven’t they…So basically they’re not all healthy, they still got salt in it”* (P35, FG6, F, Age 9, KS2)

When children in this group were asked whether crisps were a healthy or unhealthy snack, they did not offer a response in line with the two choices offered:

*“I think it’s in the middle because potatoes are healthy but it’s got salt on it so it’s not very healthy, it’s got salt on it.”* (P32, FG6, F, Age 10, KS2)

*“It’s like a bit of both…so basically they’re not all healthy, they still got salt in it”* (P35, FG6, F, Age 9, KS2)

*“It’s like in a zone: healthy zone, not healthy zone, it’s about in the middle”* (P30, FG6, M, Age 9, KS2)

Children demonstrated consistent reasoning as they extended these beliefs to chips and attributed the healthy property of chips to potatoes and the unhealthy property in relation to salt.

This confusion has been identified in the literature previously as some children view fries as healthy because they are made from potatoes and other children recognise the salt and fat content constitutes this an unhealthy food (Hesketh, Waters, Green, Salmon & Williams, 2005). Thompson, Blunden, Brindal and Hendrie (2011) warn that this uncertainty of how to classify food with both healthy and unhealthy ingredients might lead children to consume the food item in order to reduce any cognitive dissonance experienced and are less likely to avoid it by identifying a healthy ingredient.

Children’s ability to categorise food as healthy or unhealthy based on its constituent parts demonstrates a potential reasoning strategy that informs the construction of a CHB, before it has been activated. This highlights the importance of ensuring children’s knowledge about the benefits of healthy food is accurate to avoid the construction of maladaptive CHBs based on categorising the properties of food and activities incorrectly.

*3.a.II Developing complexity of compensatory reasoning with age*

Differences based on age, indicative of increasing developmental complexity, were apparent in relation to CHBs across a number of health domains. Younger children demonstrate simplistic compensatory reasoning for some behaviour and do not hold CHBs across all health domains compared with older children who hold a wider range of CHBs, across a number of health domains. This is consistent with Piagetian- frameworks such as Bibace and Walsh’s (1979) cognitive-developmental framework of health and illness which assumes children’s cognitive-development progresses as a result of qualitative changes based on age, with younger child having limited cognitive capabilities and unable to offer explanations beyond their prescribed framework. However, differences in the complexity of compensatory reasoning were also apparent within children of the same age group with explanations ranging from very simplistic to complex. Complexities of explanations also differed within the same child with simplistic explanations offered for behaviour in the activity domain and more complex explanations for dietary behaviour. These differences could be understood based on Bandura’s social cognitive theory (1977) which identifies cognitive development as a process of interactions with the environment which inform children’s thinking about the world. Children’s experiences and increased opportunities to engage in dietary choices could explain why increasingly complex explanations are identified for behaviours within this health domain. Explanations may vary as a function of age due to limited access to behaviours within the environment which increases as children become older and increasingly regulate their own behaviour. This highlights the complexity of classifying health concepts for children based on age alone.

***3.a.II.i Differences in explanations***

Pre-existing cognitive structures and self-beliefs exert an influence on which aspects of functioning are given the most attention (Bandura, 1991; Bibace & Walsh, 1979). This highlights the importance of having the cognitive capacity to engage in compensatory reasoning which involves flexibility and reversibility of thought. Not all children demonstrate the cognitive capacity to engage in compensatory reasoning for certain behaviours. The following quotes demonstrates an inability to explain fresh air compensating for prolonged screen time, followed by a child of a similar age demonstrating advanced reasoning in relation to the same topic:

*“Because if you get a heat sweaty you need to get a drink”* (P11, FG2, F, Age 6, KS1)

*“[fresh air is] A little bit [better] cos you’re not actually exercising you’re just standing outside… if you go outside and do some exercise and all you can do it, inside, you will get healthy. Cos your bones feel what you’re doing and then they get stronger…Cos your brain gets very slowly, very slowly it gets really healthy and it makes and it makes ideas come out your head”* (P25, FG5, F, Age 6, KS1)

This latter quote demonstrates an understanding that fresh air is insufficient and that there are wider benefits of physical activity including cognitive and physical development, whereas the former quote demonstrates very simplistic reasoning. This quote would suggest this child does not have the cognitive capacity to hold CHBs as she was unable to explain the abstract benefits of fresh air as a compensatory behaviour for prolonged screen time. However, the same child identified a CHB based on a concrete, compensatory behaviour, fruit consumption:

*“Sitting down so longer than you’ve done it before watching tele that’s bad for you…Have some fruit”* (P11, FG2, F, Age 6, KS1)

The data demonstrates children have the cognitive capacity to hold CHBs for particular behaviours but are unable to hold CHBs for other behaviours, with the construction of CHBs based on concrete compensatory behaviours easier to develop than abstract compensatory behaviours. This is in line with Bandura’s (1977) claim that self-beliefs exert an influence on which aspects of functioning are given the most attention, and children may have highly self-efficacious beliefs in their capability to consume fruit. These quotes also highlight the complexity of children’s understanding of health as children of similar ages offer different levels of explanation for the same behaviour which does not lend support to Bibace and Walsh’s (1979) developmentally ordered framework which assumes children of similar ages will demonstrate similar reasoning.

The analysis also identified differences for explanations across health domains. KS1 children did not identify CHBs in relation to unhealthy dinners and identified fewer CHBs in relation to sleep. Both KS1 and KS2 children identified fewer CHBs for sleep with one CHB identified in KS1 in relation to sleep compared with six CHBs in KS2 groups. Sleeping patterns of children are generally regulated by adults at this age which means children do not have the opportunity to self-regulate this behaviour and may not develop compensatory reasoning strategies as a result. According to the adult CHB model volition is important when developing a CHB as this construct is relevant to behaviours requiring self-control (Rabiau, Knauper & Miquelon, 2006). If children do not have, or do not perceive having control over a situation, they will not experience a self-regulation conflict (Ajzen, 1991). If children have no control over aspects of their routine such as sleep or choices in relation to dinner, then the experience of self-regulation conflict that leads to the development of a CHB will not occur and could explain why younger children do not hold CHBs for unhealthy dinners and fewer CHBs for sleep.

***3.a.II.ii Similarities in compensatory behaviours***

The data indicates children hold the largest number of CHBs for snack consumption such as eating sweets, chocolates and crisps compared with any other topic that was discussed. Older children identified a wider range of unhealthy dietary items but hold similar CHBs for unhealthy behaviours. Brushing teeth was identified as a key compensatory behaviour in both KS1 and KS2 groups for sweet consumption:

*“Brush your teeth after you’ve had some sweets…It’s on your teeth the sweets and it will take it off”* (P9, FG2, F, Age 6, KS1)

*“It’s like poison in the thing and you brush it and it gets all the dirt away”* (P8, FG2, M, Age 6, KS1)

*…if you brush your teeth after you’ve eat sweets then your teeth won’t get plaque on them…”* (P35, FG6, F, Age 9, KS2)

*“… brush your teeth otherwise they’d probably start to disappear and you’ll have to have a filling”* (P2, FG1, M, Age 8, KS2)

CHBs for sweet consumption based on brushing teeth were explained in terms of eliminating concrete, negative consequences. Very young children talk about ‘poison’, ‘dirt’ and ‘bugs’ that can be brushed away. This supports the idea that young children have the cognitive capacity to hold CHBs based on concrete behavioural consequences that they have control over. Older children demonstrate similar reasoning in terms of preventing similar negative consequences of erosion of tooth enamel and plaque on teeth but older children use more advanced language to articulate this and do not talk about ‘bugs’. The ease with which children discuss these beliefs could be linked to their daily experience of brushing teeth, thus it is behaviour that they are confident in their ability of and is linked to the concept of self-efficacy (Bandura, 1997). Rabiau, Knauper and Miquelon (2006) believe that self-efficacy is important in the process of generating a compensatory action and individuals are likely to develop a CHB for behaviour they believe they can carry out. This could explain why children identify brushing teeth as a key compensatory behaviour for a number of unhealthy activities.

Similar CHBs were also apparent for prolonged screen time with rest, food, fresh air and physical activity identified as compensatory behaviours in both KS1 and KS2. CHBs for prolonged screen time included:

*“Go to sleep”* (P16, FG3, M, Age 6, KS1)

*“When you’re eating you’re just sitting down like playing on your DS or playing on your play station all your food gets crushed up and you get a bellyache and that’s not healthy for you… So after you’ve eat your dinner you should always go and do some, really exercise and like go and have after you’ve eat your dinner go and have your food and go and do some exercises”* (P25, FG5, F, Age 6, KS1)

*“…Once you’ve done it [prolonged screen time] probably just start running around and do push ups and that”* (P2, FG1, M, Age 8, KS2)

Children in both KS1 and KS2 identified physical activity as a compensatory behaviour for prolonged screen time. Whilst age differences were not apparent in relation to the nature of CHBs identified, age differences were apparent in relation to the type of physical activities identified. Older children discuss a wider range of physical activities than younger children. This could be because older children have access to a wider range of activities and an increased awareness of different types of physical activities which then informs the development of a wider range of CHBs based on variants of physical activity.

Children’s developing complexities have been demonstrated in previous research exploring health and illness concepts in children, which include children’s concepts of the common cold (Myant & Williams, 2005; Bibace & Walsh, 1980) and AIDS (Walsh & Bibace, 1991). This analysis demonstrates developing complexities are apparent in compensatory reasoning also and could be explained based on children’s interaction with the environment which increases with age, thus increasing the complexity of compensatory reasoning based on internal and external influences.

***3.a.II.iii Moral reasoning could precede compensatory reasoning***

A key difference between KS1 and KS2 children was apparent in relation to morality. Discussing behaviour in terms of morality came up during each KS1 FG discussion but was not discussed in any of the KS2 groups. When discussing potential CHBs for unhealthy activities and sweet consumption, one child explained:

*“If you do something wrong you should go and say sorry and apologise and say sorry and make ‘em happy again”* (P25, FG5, F, Age 6, KS1)

When discussing prolonged television viewing the same child explained:

*“I think about if I’m doing the right thing and the wrong thing. If I think I’m doing the wrong thing like I’ve hurt somebody I make ‘em better, or I, or I’ve eat my dinner and then go and sat watching TV I do some exercising.”*

This suggests that whilst younger children engage in fewer, more simplistic compensatory beliefs, it could be argued that moral reasoning precedes compensatory reasoning and as children’s cognitive-development advances, so does the focus of children’s reasoning. Based on a Piagetian framework children within this age group cannot differentiate mind and body and so immoral behaviour, usually described as bad behaviour in children, is functionally equivalent to dirt or germs as a cause of illness (Bibace & Walsh, 1979). As identified earlier, children tend to categorise food as ‘good’ or ‘bad’ and so simplistic categorisations of food and behaviour could become more internalised as children develop and begin to regulate their own behaviour.

The concept of compensatory reasoning in children may begin with moral reasoning which is determined by the environment and culture in which children live (Bronson, 2000), followed by more simplistic reasoning in relation to a child’s day-to-day choices which then become increasingly advanced as children have more choices and opportunities to regulate their own behaviour. This will require further research as it is beyond the aims and objectives of this programme of research but further exploration of this may help understand how children’s compensatory reasoning may develop from a very young age and progress into adulthood across a range of health domains.

***3.a.II.iv Not all children hold CHBs***

It is important to note that not all children hold CHBs. Reasons for this differ: children may not have the cognitive capacity to identify appropriate causal factors of unhealthy behaviour or the flexibility of thought that is required to engage in compensatory reasoning; other children simply do not hold CHBs for diet and activity.

The following quote demonstrates that not all children have the cognitive capacity to hold CHBs:

*“Like if you weren’t and you ain’t got any food and no pennies to buy food and you eat worms you might get germs off a worm…it would have mud on it and you would to eat the mud and the worm”* (P28, FG5, F, Age 5, KS1)

This explanation was offered to explain unhealthy food consumption and does not indicate compensatory reasoning is possible. It is indicative of simplistic reasoning where the causal pathway of unhealthy behaviour is not in the control of the child.

The data indicates children do not engage in compensatory reasoning when engaging in sweet consumption and prolonged screen time during discussions based on the knowledge that there are negative consequences of engaging in these behaviours:

*“I don’t think about it…I just eat it, I just go [imitates eating]”* (P8, FG2, M, Age 6, KS1)

*“You’re like working out your body”* (P21, FG4, F, Age 9, KS2) [wii fit and fitness DVD]

The latter quote demonstrates that this activity does not require construction of a CHB as the level of movement involved was considered to be of sufficient intensity to have positive health benefits, therefore a CHB was not required to eliminate any perceived negative consequences.

*3.a.III Self-regulation*

Self-regulation is a broad concept that focuses on an individual’s motivation and ability to modify behaviour to achieve goals; it requires the regulation of behaviour and internalisation of rules of conduct (von Suchodoletz, Trommsdorff & Heikamp, 2011). This study has demonstrated that children do not hold CHBs either because they do not have the cognitive capacity to engage in this type of reasoning or because they do not think about the behaviour that they engage in as healthy or unhealthy at the time of performing it. Therefore, activation of a CHB in children appears to be a motivated, cognitive, self-regulatory strategy, in line with the adult definition proposed by Rabiau, Knauper and Miquelon (2006). This section will outline the self-regulatory strategies that children identified, which were based on behaviours that were easily accessible in their environment and may have been informed based on personal experiences, both positive and negative, of engaging with these behaviours. These experiences could contribute to the development of self-regulatory strategies that inform the construction of a CHB.

***3.a.III.i Self-regulatory strategies based on minimising and increasing behaviour***

Developing self-regulatory strategies has been recognised as necessary in order to thrive in a complex physical, social and cultural context where individuals must make decisions to support their own healthy functioning (Lerner et al., 2011). As defined by Lerner et al. *“Self-regulation involves actions designed to either enact strategies for attaining the aims of (goals for) selected transactions with the context or for compensating effectively when goals are blocked or initial actions fail”* (p.3). Children in this study have demonstrated a range of strategies to employ when faced with behavioural choices in relation to a number of activities. Children in both KS1 and KS2 recognise that they can minimise engagement with unhealthy behaviour and increase participation in healthy behaviour, thus demonstrating awareness that certain behaviours are within their control and can be modified to regulate a healthy lifestyle. This is an important strategy and essential in order to develop CHBs.

Self-regulatory strategies include regulating sweet consumption and minimising screen time:

*“On Monday a bit of sweet and a bit of a chocolate and on Saturday a bit of sweet and a bit of chocolate and Sunday a bit of sweet and a bit of chocolate. And you shouldn’t eat loads because your teeth will go all rotten…”* (P25, FG5, F, Age 6, KS1)

*“And don’t eat them every day”* (P21, FG4, F, Age 9, KS2)

*“Don’t buy many, buy less…about three –four- five”*(P20, FG4, F, Age 10, KS2)

*“Don’t go too close to the TV and and stay on it for ten minutes and that’s it”* (P13, FG3, M, Age 7, KS1)

*“To play on it a lot less…half an hour”* (P20, FG4, F, Age 10, KS2)

In addition to minimising behaviour, children identified a range of self-regulatory strategies to actively compensate for an unhealthy diet:

*“Have a healthy snack or run around a bit afterwards…“Because your cancelling out the…you know, you’re cancelling out the, cancelling out the bad…the fat…It burns off calories.”* (P22, FG4, M, Age 9, KS2)

*“You can go on a dog walk with your dogs if you’ve got any”* (P21, FG4, F, Age 9, KS2)

*“You could walk down Matlock*” (P20, FG4, F, Age 10, KS2)

*“Go to the local leisure centre…You could either go to the gym or do some laps and swimming… Because if you’re swimming it you’re burning off your fat and the calories”* (P21, FG4, F, Age 9, KS2)

*“…you could go bike riding round your local block*” (P21, FG4, F, Age 9, KS2)

*“About eight runs around your street or four or something like that…to burn out calories”* (P23, FG4, M, Age 10, KS2)

The data suggests children have developed self-regulatory strategies based on activities available within their environment. Children can make predictions and develop expectations based on their experiences and this can guide children’s motivation to control their own activities (Bronson, 2000). Children may have experiences of these activities in their environment which could increase their self-efficacy concerning the compensatory behaviour. High self-efficacy towards the compensatory behaviour is associated with an increased likelihood of activating CHBs in the adult CHB model (Rabiau, Knauper & Miquelon, 2006) and a similar process could also be involved in the construction of CHBs for children.

Children also demonstrate the ability to monitor their own behaviour which is the ‘self-observation’ sub-process involved in self-regulation; evaluate whether or not their behaviour is effective which is the ‘self-judgement’ sub-process; and modify behaviour resulting from this evaluation which is the ‘self-reaction’ sub-process involved in self-regulation (Bandura, 1997). The following quotes illustrate children’s self-observation, self-judgement and self-reaction in relation to prolonged screen time and sweet consumption:

*“The first minute after three hours I thought that I shouldn’t really be doing this so I turned my TV off and went downstairs and had some fruit”* (P34, FG6, F, Age 9, KS2)

*“If sweet stuff gets on your teeth and you don’t brush it off little bugs that are on sweets they stop there and eat your teeth”* (P12, FG2, F, Age 6, KS1). She explained to *“Brush my teeth…properly”* could eliminate the negative effects of sweet consumption.

These quotes demonstrate children’s ability to monitor and modify their behaviour. The latter comment suggests a conscious effort would be required to ensure teeth were cleaned *‘properly’* whereas if sweets were not consumed that day, less effort or self-monitoring may be involved. This process could inform the construction of a CHB when children bring to the consciousness the benefits of a daily health-protective behaviour which can eliminate the negative consequences of an unhealthy behaviour in order to justify an unhealthy snack, consumption of which is in their control.

Research has shown that children with the capacity to regulate behaviour stay leaner in the transition to adolescence (Duckworth, Tsukayama & Geier, 2010) and children who self-regulate while eating are less likely to be overweight than children who do not show the same capacities for self-regulation (Tan & Holub, 2011). Similar research is apparent in relation to physical activity as Piche, Fitzpatrick and Pagani (2012) found that kindergarten self-regulation was a predictor of lower BMI and greater sports participation. This can be explained in terms of Bandura’s social cognitive theory which posits that children with poorer self-regulatory skills may have limited response inhibition to distractions and temptations which can increase their inclination to engage in unhealthy behaviours (Bandura, 2004; Epstein, Salvy, Carr, Dearing & Bickel, 2010). Inhibitory control is a regulatory mechanism that facilitates interactions with the environment by aligning current thought and action with priorities of changing goals and stimuli (Logan, 1994). Identifying a number of strategies to promote healthy behaviours suggests children show inhibitory control when constructing a CHB when faced with stimuli that might compromise health goals or behavioural standards imposed on them. Further research is required to explore whether children’s use of CHBs as a regulatory strategy for lifestyle behaviours is adaptive or maladaptive in terms of weight.

***3.a.III.ii Personal experience informs the development of a CHB***

Children’s early experiences with the environment teach them about the world and also their ability to cope with and influence objects and events (Bronson, 2000). The construction of a CHB may be informed by children’s personal experiences with health-protective and health-risk behaviour. The data indicates children have successfully carried out compensatory behaviours and such experiences could reinforce the use of CHBs in future situations.

Children discuss a range of experiences in relation to a high-sugar diet, prolonged screen time and sleep. The data demonstrates children’s experiences of eliminating or minimising the negative effects of unhealthy behaviour they have engaged in by engaging in a healthy behaviour:

*“…I get up and walk around the house…I go out, run around, go back in and watch tele again.”* (P12, FG2, F, Age 6, KS1)

*“I know it is a bit bad for me but… I like put myself to a limit and say I’ll just have one more and I do cos I know it’ll start getting bad on me and then I eat some fruit after that”* (P35, FG6, F, Age 9, KS2) [sweets]

*“You could have a lie in…I always do that…It gives me more time to sleep”* (P20, FG4, F, Age 10, KS2)

Children’s positive experiences of engaging in healthy behaviours to minimise the negative effects of unhealthy behaviour might encourage the construction of a CHB where children have perceived a healthy behaviour compensating (regardless of its accuracy) for an unhealthy behaviour, thus increasing their self-efficacy belief to perform the compensatory behaviour and for it to successfully eliminate the negative effects. Functional operations of self-regulatory systems are based on people’s beliefs about their capabilities to exercise control over their own level of functioning and over events that affect their lives; this is the self-efficacy mechanism (Bandura, 1991). Carrying out activities successfully in the past might inform feelings of competence and mastery in children’s ability to perform a compensatory behaviour and reinforce the use of such beliefs in future situations.

Children’s negative experiences may also inform the construction of a CHB as children have an increased awareness of the negative consequences and could contribute towards experiencing cognitive dissonance when tempted to indulge in similar items. The following quote demonstrates a negative experience of high-sugar consumption which was compensated with physical activity:

*“You know I’ve ate icing on my birthday I had like this a dinosaur cake and it said triceratops on it was the name of the dinosaur and I had it and I ate and when I was at home I ate all the three horns off it, the frill off it and the tail off it. I ate all them off and… And two of the legs, I feeled very poorly… I felt sick…I got outside but it was dark I didn’t mind cos I could see cos I’ve got good eyes and I ran, I ran, I ran about ten laps”* and when asked how he felt after that he replied *“I feeled fine cos it gets all the sugar out”* (P27, FG5, M, Age 5, KS1)

Such negative experiences may lead children to identify a CHB to minimise the negative effects of a future activity based on an increased perception of risk. Bandura (1991) argued that self-regulatory systems are based on forethought and that humans have possession of self-reflective and self-reactive capabilities to enable control over thoughts, feelings, actions and motivations. Children’s negative experiences might serve as a guide and motivator to regulate their actions anticipatorily through self-reactive influence and encourage the use of CHBs to minimise these negative effects.

The data suggests younger children may struggle to hold CHBs as they are unable to regulate their behaviour based on the lack of ability to control their actions and therefore unable to engage in self-reflective and self-reactive capabilities. An example of this is in relation to children’s uncertainty in relation to the number of fruit and vegetables consumed:

*“I think I do I don’t know”* (P11, FG2, F, Age 6, KS1)

*“I think I have three or five”* (P10, FG2, M, Age 6, KS1)

*“I’ve only had two, two a day”* (P8, FG2, M, Age 6, KS1)

Compensatory reasoning may be less apparent for these behaviours as this is a strategy employed for behaviour within an individual’s control (Rabiau, Knauper & Miquelon, 2006). If children do not have control over their diet they are less likely to engage in compensatory reasoning for dietary behaviour.

Children identify a number of strategies to regulate their behaviour. Positive and negative experiences of engaging in behaviour appear to inform children’s self-efficacy beliefs that a healthy behaviour can eliminate the consequences of an unhealthy behaviour. These experiences could inform the construction of a CHB as children are more likely to construct a CHB based on the belief that they are capable of performing the compensatory behaviour.

*3.a.IV Desire*

According to adult CHB literature, development of a CHB results from the desire to indulge in tempting but unhealthy activities (Knauper, Rabiau, Cohen & Patriciu, 2004). The temptation to consciously indulge in unhealthy activities was also apparent in this study as children described the feeling of temptation they experience in relation to a number of activities, but mainly in relation to sweet consumption.

Sweets were identified as a key unhealthy snack due to the sugar content and the data indicates children experience the temptation and desire to consume sweets. Awareness that fruit is the healthier snack choice when asked about sweet consumption was evident:

*“...you should really be eating an apple”* (P34, FG6, F, Age 9, KS2)

This demonstrates learned eating appropriateness standards which are an important factor in eating behaviour as they can support children to make eating-related behavioural decisions, thus reducing the burden on individual self-regulation (De Ridder, De Vet, Stok, Adriaanse & De Wit, 2013). However, this analysis demonstrates that although children learn eating appropriateness standards, they explain the desire to indulge in high-sugar snacks:

*“I’ve had sweets…I love them”* (P8, FG2, M, Age 6, KS1)

*“I like sweeties”* (P29, FG3, F, Age 6, KS1)

*“Basically say with an apple…Basically you take a bite and you don’t want it but with sweets when you take a bite you want more sweets because it’s got sugar and stuff in”* (P34, FG6, F, Age 9, KS2)

*“…well when you drink, when you drink orange juice it tastes that sweet you’ll want more because it’s got sugar in it…Because it tastes so sweet and it’s got sugar in it and everybody likes sugar, well not everybody but I like sugar but I don’t like too much of it”* (P32, FG6, F, Age 10, KS2)

*“I love coke”* (P8, FG2, M, Age 6, KS1)

There is a clear desire for children to eat sweets and this desire for sweet things is often from birth (Palmer, 2006). According to Dovey (2010) ‘liking’ is the hedonic impact or pleasure brought about by the taste experience and there is an innate preference to consume foods with high levels of sugar and salt tastants. Children might experience a conflict between this innate desire to consume sweet snacks when faced with external behavioural standards discouraging excessive sweet consumption such as parental controls on sugar consumption intake. De Ridder, De Vet, Stok, Adriaanse and De Wit (2013) identified snack consumption as one of the most important contributors to the overweight epidemic due to the ‘toxic food environment’, which features the availability and accessibility of unhealthy food choices which can promote over-consumption of food and increased weight.

With multiple opportunities available in the environment to indulge in unhealthy snacks, it is possible that children experience cognitive dissonance when faced with unhealthy choices that they find innately appealing but are discouraged to indulge in. This might encourage children to construct CHBs to justify sweet consumption, as the temptation they experience is an innate drive which conflicts with externally imposed behavioural standards.

Children discussed their desire to consume unhealthy dietary items in almost all groups. Fewer responses were apparent in relation to the desire to engage in sedentary behaviour:

*“The activity is probably watching, sitting on your bum watching tele all day”* (P33, FG6, M, Age, 9, KS2)

This could be because being inactive does not require activation of additional behavioural or cognitive strategies such as planning or rely on forethought to construct self-regulatory strategies in order to engage in sedentary behaviour or prolonged screen time. The desire to engage in sedentary activities may not be driven by internal biological influences in the same way as dietary choices and any cognitive dissonance experienced in relation to levels of activity could be linked to external behavioural standards imposed on children.

*3.a.V Health Goals*

The purpose of the FGs was to identify children’s health beliefs. However, the data demonstrated children hold health goals which were based on intrinsic and extrinsic motivation. Health goals based on intrinsic motivation are those that are internal to an individual and health goals based on extrinsic motivation are those that are external to the individual (Deci & Ryan, 2000).

An example of a health goal that appeared to be internally motivated came up when discussing whether or not lack of exercise was acceptable:

*“Not for me, I want to get healthy”* (P13, FG3, M, Age 7, KS1)

A similar health goal became apparent during a KS2 discussion in relation to the fat content of food:

*“I don’t want to gain weight I want to get rid of it”* (P23, FG4, M, Age 10, KS2)

Personal behavioural standards are standards that people themselves find appropriate and are important in self-regulation (Carver & Scheier, 2004). Rabiau, Knauper and Miquelon (2006) believe compensatory reasoning is not related to intrinsic motivation as behaviour motivated intrinsically is linked to satisfaction associated with the behaviour. Rather, CHBs are associated with extrinsic motivation with introjected regulation, a form of external regulation, associated with increased use of CHBs. This is because introjected regulation is based on performing behaviour to avoid guilt and shame and to attain feelings of worth (Deci & Ryan, 2000; Rabiau et al.). It is unclear what children’s motivations are for holding these health goals but it is clear that health goals might conflict with behavioural choices linked to a high-sugar and high-fat diet which might compromise these goals.

An example of an extrinsically motivated goal linked to health behaviour was:

*“On a CBeebies magazine and there’s like a number jacks thing and it said on, on [pause says days of week to himself] the day after Wednesday it says your mission is to eat five fruits one day”* (P27, FG5, M, Age 5, KS1)

External regulation includes being motivated to perform behaviour to obtain rewards or avoid punishment (Deci & Ryan, 2000). External rewards diminish responsibility for outcomes of behaviour and have been associated with poorer dietary habits (Savage, Fisher & Birch, 2007). Rabiau, Knauper and Miquelon (2006) believe CHBs are unlikely to be activated in adults that hold externally regulated health goals and instead individuals are more likely to not resist the temptation or change the outcome expectancies of behaviour. It is unclear whether children will adopt a similar strategy as children’s motivations differ from adults on the basis that they have less control over their environment. Children may be motivated to avoid punishment and they could use compensatory behaviours to negotiate access to an unhealthy behaviour. Therefore, CHBs in children may not be used to minimise internal cognitive dissonance but to avoid the conflict that could occur as a result of punishment (where behaviour is externally regulated).

Motivation and self-regulation are highly interrelated (Bronson, 2000) and it could be that children are motivated, intrinsically and extrinsically, by health goals, and when these goals are compromised in the face of temptations to eat unhealthy food such as sweets, this could potentially inform the construction of a self-regulatory strategy such as construction of a CHB. Different types of motivations and its relationship to compensatory reasoning is beyond the scope of this programme of research but could be worth exploring further in future research.

The analysis has identified a number of internal influences on the construction of a CHB. Children adopt a number of different reasoning strategies to construct a CHB. These include categorising food with functional values such as fruit and vegetables having fat burning properties. Age differences were apparent in the number of CHBs identified with older children offering a wider range of CHBs across a number of health domains. Not all children hold CHBs, which highlights the fact that the construction of a CHB is a self-regulatory strategy in children. Self-regulatory strategies for modifying behaviour were based on children’s experiences of engaging in health-protective behaviours of fruit and vegetable consumption, physical activity and brushing teeth. Children appeared to have high self-efficacy for these behaviours which were frequently associated with CHBs as compensatory behaviours. The experience of temptations in relation to a high-sugar diet was apparent and in addition to this, children held health goals of being healthy and eating fruit and vegetables. This suggests children may experience cognitive dissonance when faced with unhealthy, yet tempting choices that interfere with personally relevant health goals and when unable to resist the temptation could lead to the construction of a CHB.

In addition to internal factors, a range of external factors were also identified which could influence children’s construction of a CHB.

*3.b External Influences*

It became clear during FG discussions that children’s external environment influenced the construction of their general beliefs and also their CHBS. External influences include role modelling and facilitating access to a range of healthy and unhealthy activities within the home, school and community setting.

***3.b.I.i Family Influences: Parents***

Bodrova, Leong and Akhutina (2011) argue that children must first engage in ‘other regulation’ before they are able to engage in self-regulation, implying that children act as recipients of another person’s regulatory processes. Parents model a range of health behaviours through role modelling and environmental structuring, and there is a plethora of research which links parental health-related knowledge, self-regulatory skills and self-efficacy beliefs with children’s health behaviours including eating habits and food choices (von Suchodoletz, Trommsdorff & Heikamp, 2011; Golan & Crow, 2004a).

Children in this study made reference to observing parental behaviour in relation to healthy and unhealthy behaviours:

*“My dad drinks coke…My dad drinks coke a lot…And beer”* (P11, FG2, F, Age 6, KS1)

*“My mum exercises…”* (P11, FG2, F, Age 6, KS1)

*“…just eat healthy thing cos my mum I think it’s either my mum or my dad whose on a diet…And we just all eating healthy now cos we just have one once in a while”* (P24, FG5, F, Age 5, KS1)

Research has shown that parental role modelling of healthy eating behaviour is positively correlated to children’s fruit and vegetable preferences; children are aware of their parents’ eating behaviours and report similar behaviour to their parents (Draxten, Fulkerson, Friend, Flattum & Schow, 2014). Golan and Crow (2004a) found that when parents provide companionship at mealtimes and model appropriate food-related behaviours, children tend to have improved dietary behaviour. Likewise Fisher, Mitchell, Smiciklas-Wright and Birch (2002) found that parents who consumed more fruit and vegetables had children that consumed more fruit and vegetables; and Lindsay, Sussner, Kim and Gortmaker (2006) identified parents that are physically active are more likely to have children who are physically active. Thus parents can shape children’s habits by serving as role models.

Accordingly, if most behaviour is learnt observationally through modelling the following statistics have implications for children: based on self-report measures 67% of men and 55% of women meet minimum recommendations for physical activity in adults which comprises of 150 minutes of moderate intensity physical activity per week in bouts of 10 minutes or more or 75 minutes of vigorous intensity physical activity per week; when using objective measures of physical activity only 6% of men and 4% of women achieved the recommended guidelines for physical activity (HSCIS, 2014). Only 24% of men and 29% of women eat five or more portions of fruit and vegetables a day (HSCIS). Thus a large proportion of adults do not meet minimum requirements for fruit and vegetable consumption or exercise and could be modelling negative behaviours to children, which dramatically increases the risk of overweight and obesity. It also questions whether or not these adults hold CHBs in relation to diet and activity. Further research is required to ascertain this, but based on previous research findings (Fisher, Mitchell, Smiciklas-Wright & Birch, 2002); Lindsay, Sussner, Kim & Gortmaker, 2006) which suggest children are more likely to eat fruit and vegetables and be physically activity if parents model these behaviours, it is possible that children are more likely to hold CHBs if their parents hold CHBs; particularly as findings from this study suggest children hold CHBs and they are susceptible to parental influence on the construction of their beliefs.

In addition to modelling their own behaviour, parents regulate children’s behaviour by enabling access to items in the environment and barriers by enforcing a routine to regulate their behaviour. Children discuss a range of strategies parents employ:

*“I have it [coke] every day for my dinner…Daddy always brings it in”* (P10, FG2, M, Age 6, KS1)

*“… you gotta do some running every single day [take bad effects of sweets away]…Cos your mum might tell you to put your sweets away and if you ignore you’ll get grounded cos my brother’s grounded for two week… Cos he was being naughty.”* (P29, FG5, F, Age 5, KS1)

*“Sometimes my mum says when I’m in my room just sitting down and watching tele and lying down my mum says I go out and have some fresh air.”* (P5, FG1, F, Age 8, KS2)

*“It is ok when you don’t when your mum doesn’t buy you any fruit…But when she does you only like get five a day only like in a week only one a week or one a month”* (P1, FG1, F, Age 8, KS2)

*“I do sometimes but I have to earn it. I have to earn sweets I have to do my bedroom”* (P5, FG1, F, Age 8, KS2)

Children do not have full control over their diet and activities and their environment could be structured in such a way that promotes the use of CHBs. Children appear to be presented with healthy and unhealthy behaviours in their environment and may reason that these behaviours can become negotiable. An example of this would be having to ‘earn’ sweets thus reasoning from an early age that an undesirable behaviour such as chores can be rewarded with a desirable behaviour. Research has shown that using rewards increases preferences for the reward item and may reduce preferences for the behaviour that is necessary to earn the reward, for example, rewarding children with dessert if they eat their vegetables could increase their preference for dessert and decrease their preference for vegetables (Birch, 1999). Compensatory reasoning involves the reversal of this process whereby healthy behaviour is performed after the unhealthy behaviour has been engaged in. It is possible that children learn to negotiate healthy and unhealthy behaviours in this manner as a result of this parental control strategy; and when increasing cognitive capacity to engage in reversibility of thought and the opportunity to regulate their own behaviour arises, children might develop this strategy to incorporate compensatory behaviour.

***3.b.I.ii Family Influences: Siblings and Extended Family***

According to Bandura’s social learning theory (1997) children learn from their environment which includes a wide range of role models. Children in this study identify wider family influences including siblings and extended family. They inform children’s health beliefs and also model positive and negative consequences of healthy and unhealthy behaviour which may later inform outcome expectations of behaviour associated with CHBs.

The data demonstrates that siblings inform the construction of children’s health beliefs:

*“Because they’ve got loads of fat and got sugar in them [fizzy drinks]…* *They actually have some drugs in them… My brother told me but I forgot which types of drugs”* (P4, FG1, M, Age 7, KS2)

*“Last night my mum gave me an egg, three sausages and two bacons and I, and it’s not healthy because my brother said that sausage has a bit of fat inside of it and plus bacon has fat on it”* (P34, FG6, F, Age 9, KS2)

Food attitudes are formed early in childhood and are reinforced by a range of family, social and cultural inﬂuences (Rozin, 1996) which highlights the importance of ensuring children’s wider environment, including siblings, is accurately informed to prevent children from developing inaccurate beliefs.

According to Bandura’s social learning theory much of our behaviour depends on our observations of various respected models (Bandura, 1997). Children in this study observed the positive and negative consequences of activities from their exposure to extended family:

*“And then you’ll get fat… and you’ll have a fat tummy like my cousin [eating sweets]”* (P29, FG5, F, Age 5, KS1)

*“My uncle …Sometimes he, when he comes and visits us he takes us somewhere to his house…He’s got kind of this floor and that and he has and he asks he tells us we have to run up the stairs ten times. Run upstairs and back downstairs and that…Because he said if you want to if you want to get muscley like me”* (P5, FG1, F, Age 8, KS2)

*“Sometimes at my granddad’s I have sometimes I have bacon and egg on Fridays and on Mondays we have a big salad”* (P5, FG1, F, Age 8, KS2)

Negative consequences that are modelled by people in children’s wider environment could inform the development of children’s health goals, such as not wanting to lose their teeth, in response to this exposure. The exposure to positive outcomes of health behaviour may also inform their outcome expectancy beliefs which could later inform the construction of a CHB.

Children in this study might model compensatory reasoning that is apparent in their environment as Bronson (2000) suggests young children imitate modelled behaviours as a means of acquiring new skills and routines which they later attempt independently. Compensatory reasoning is apparent in an adult population (Knauper, Rabiau, Cohen, Patriciu, 2004) and it would be useful for future research to assess whether a relationship exists between parents, siblings and children’s reasoning strategies in order to understand how compensatory reasoning develops. It could be that children learn to construct CHBs as a result of observing role models in their environment. Children’s externally regulated behaviour could later become internalised and could inform the development of CHBs for behaviours that are within children’s control.

*3.b.II Social Influences*

Children’s beliefs continue to develop as a result of interactions between individual, environmental and behavioural factors (Bandura, 1986). Part of the process of children’s functioning gradually progressing from external to personal control involves the acquisition of knowledge about oneself and the external world from the social environment (Bandura, 1977). In this study, children identify factors within their social environment which informs their beliefs, including their use of language to describe cultural values reflecting the current environment, the influence of peers, school and media to inform their health beliefs and health goals.

The data demonstrates the cultural environment children are exposed to:

*“Like on a Sunday I just chill and watch films”* (P19, FG4, F, Age 10, KS2) [lack of PA]

*“Sunday’s a day of rest…”* (P22, FG4, M, Age 9, KS2) [lack of PA]

*“Well you just, your body’s just deleted the coke and then”* (P18, FG4, KS2) [water] “… *Delete is on the computer by the way”* (P20, FG4, F, Age 10, KS2)

These examples highlight social influences on development of children’s beliefs. Vygotsky (1978) believed that language and culture were important elements in motivation and self-regulation as behavioural goals are approved by the culture. The belief that ‘Sunday is a day of rest’ stems from cultural values rooted in Christian traditions and appears to form part of the discourse when children explain why they do not engage in daily physical activities. Use of language to describe the process of water compensating for fizzy drink consumption demonstrates children’s thinking is influenced by their exposure to technology as it is unlikely children 30 years ago would have articulated this belief due to their lack of opportunity or availability to engage in the process of deleting items off a computer screen. Conversely, they may have used language such as ‘rub out’ which would be indicative of behaviour within their personal control when stationery such as pencils and rubbers were the only options available in children’s environment.

As the current environment that children are exposed to in the UK has been defined as ‘obesogenic’ due to the increased availability of unhealthy food and lack of physical activity opportunities (Foresight, 2007), elements within children’s environment might encourage the use of CHBs based on their interaction with peers, school and media influences.

***3.b.II.i Social Influences: Peers***

The influence of the social environment and, in particular, the views of peers and ‘significant others’ is a common theme as people tend to engage in behaviour which is practised by, and valued by their peers (National Obesity Observatory, 2011). The following quote demonstrates children’s responsiveness to the social environment:

*“If you eat loads and loads and loads [sweets] you’ll have to have all your teeth taken out and they’ll never grow back again and then everybody will laugh at you”* (P25, FG5, F, Age 6, KS1)

Peers and friends play an important role in influencing children’s developing attitudes and behaviours (Houldcroft, Haycraft & Farrow, 2014). This quote could inform the development of a negative attitude towards health-risk behaviour such as sweet consumption. The outcome expectancy belief of sweet consumption is that it will cause tooth loss and this outcome is evaluated negatively based on peer influence. This attitude towards sweet consumption could then inform the construction of health goals which are extrinsically motivated, based on introjected regulation, that is, to avoid shame, and lead to regulation of sweet consumption. This type of peer influence could inform the development of health goals and attitudes which conflict with an innate desire to consume sweet food and increase the likelihood that CHBs will be used when faced with sugary snacks.

***3.b.II.ii Social Influences: School***

School is the third influential factor after parents and peers on children’s beliefs, with teachers serving as important contributors to children’s knowledge (Pastorelli et al., 2001). In this study, the school environment appeared to inform children’s beliefs based on observational learning from teachers and also as a result of environmental structuring of the school day which involves active and sedentary periods informing children’s beliefs in relation to their own levels of activity.

The data demonstrates teachers influence children’s beliefs in relation to sweet consumption:

*“It’s alright if you have like sweets like special sweets like say if you like doing some sports and the teacher gives you a sweet just to build your energy up more so you can run better and faster”* (P21, FG4, F, Age 9, KS2)

This belief involves the process of categorising sweets to have functional value to improve sports performance and with the approval from a role model in the environment, the child identified a suitable occasion to consume sweets. The interaction between these cognitive and external influences could form part of the process by which compensatory reasoning develops. As children’s beliefs transition from being externally regulated to becoming more internalised, children might then begin negotiating healthy and unhealthy choices in their environment without the approval of teachers.

Other factors that appear to influence children’s internal beliefs include the structure of the school day. The following comment was in response to a discussion in relation to running outside in order to compensate for watching lots of television:

*“That’s what we do at school we sit down, we do work and then we go out to play”* (P4, KS2, M, Age 7, FG1)

This demonstrates the importance of environmental structuring and the impact this can have on children’s reasoning. It is important to ensure children’s environment models health-protective behaviour which is increasingly important as the UK environment is currently defined as ‘obesogenic’ (Foresight, 2007). The current structure of dietary and physical activity choices may promote over-consumption of unhealthy food based on marketing strategies such as placing sweets and chocolates at supermarket checkouts and lack of physical activity opportunities due to fewer ‘green spaces’ in which to engage in physical activity (Foresight, 2007).

***3.b.II.iii Social Influences: Media***

The role of social learning is also demonstrable from the impact of television and food advertising with children learning unhealthier food preferences resulting from media campaigns (Radnitz et al., 2009). The modern health media and food industry have shaped the public’s views of healthy eating as well as the tendency to view foods as good or bad for health (Oakes (2005). The power of media has been utilised to promote positive health behaviour with implementation of social marketing strategies such as the Department of Health’s Change4Life campaign which is intended to provide the public with advice on healthy diets and physical activity (National Obesity Observatory (NOO), 2014).

Children in this study were responsive to media efforts to promote healthy behaviour as children in different groups mentioned Change4Life when discussing alternative strategies to promote fruit consumption:

*“If you’re stood up”* (P32, FG6, F, Age 10, KS2)

*“While watching it…It’s like that Change4Life advert where you’ve got these people sitting on a bike and eating fruit while watching TV”* (P30, FG6, M, Age 9, KS2)

*“If you eat too much fat you can come out with type-two diabetes and what’s that cancer”* (P21, FG4, F, Age 9, KS2) which prompted the question *“You’ve watched that change for life thing ain’t ya”* (P20, FG4, F, Age 10, KS2)

Initiatives such as Change4Life have been important in helping to educate the public and promote better diet and activity choices (NOO, 2014). Children in this study demonstrate the effectiveness of this media campaign as it informed their health beliefs in relation to increasing fruit consumption and also awareness of risk factors associated with a high-fat diet.

If future research suggests CHBs are associated with poorer health outcomes in children, it would be worth considering use of similar social marketing strategies to discourage the use of CHBs or to challenge and correct maladaptive CHBs that children hold as children in this study demonstrate they are receptive to such influences.

These findings demonstrate children are susceptible to a range of external influences in relation to developing health beliefs. During FG discussions children were not asked about social influences on health beliefs. They were asked about the beliefs that they hold in relation to diet, activity and aspects of their routine including brushing teeth, missing meals and sleep. Reference to external influences in relation to family, peers, school and media were unprompted and suggest these influences are important in the development of children’s beliefs.

**4.4 Discussion**

The aims of this study were to explore children’s beliefs specifically in relation to CHBs for behaviours implicated in a healthy lifestyle and to consider the influences on children’s CHBs. The analysis identified three themes *‘General Health Beliefs’*, *‘Compensatory Health Beliefs’* and *‘Influential Factors on CHBs’*.

The first theme ‘*General Health Beliefs’* identified a range of accurate and inaccurate beliefs that children hold in relation to activity levels, diet and routine including meal times, brushing teeth and sleep. Children are exposed to a number of externally imposed behavioural standards which promote daily physical activity of at least 60 minutes and a minimum of five portions of fruit and vegetables a day, and guidelines which also discourage inactivity and a high-sugar and high-fat diet (Chief Medical Officer, 2011; Department of Health, 2005). Children in this study hold accurate health beliefs (AHBs) in relation to each of these activities. They identify the need to engage in regular physical activity of at least moderate levels of intensity and to avoid prolonged screen time for optimal health (Chief Medical Officer; Sigman, 2012). Accurate dietary beliefs included the need to eat five portions of fruit and vegetables a day (Department of Health) and to avoid a high-sugar and high-fat diet based on negative consequences relating to oral health and weight gain (Gavin, 2008). Children also accurately identified the negative consequences of not brushing teeth, eating breakfast or obtaining sufficient levels of sleep based on negative physiological outcomes of tooth loss and feeling tired (Makuch & Reschke, 2001; Nguyen-Duc, 2006).

The accuracy of behavioural beliefs in relation to health-protective behaviours such as physical activity, eating fruit and vegetables, brushing teeth and sleeping on time, when evaluated positively, forms a positive attitude towards the behaviour, and according to the Theory of Planned Behaviour this will form an intention which increases the likelihood of performing the health-protective behaviour (Ajzen, 1991). Accurate beliefs and outcome expectations of health-risk behaviour when evaluated negatively, such as “watching TV all day will make me fat and I don’t want to be fat” will form a negative attitude and decrease the likelihood of engaging in health-risk behaviour. It is important, therefore, to continue to promote AHBs in children by promoting the positive consequences of health protective behaviours and by highlighting the negative outcomes of health risk behaviours.

The data identified inaccurate health beliefs (IHBs) in relation to similar behaviours. Children did not understand that physical activity is a daily requirement and when seemingly correct responses such as eating five portions of fruit and vegetables a day were explored, it became apparent it was not always clear what this meant in behavioural terms as five portions of fruit was identified as comprising ‘five-a-day’. IHBs in relation to the absence of sugar in coke demonstrates the importance of ensuring such beliefs are targeted and corrected, as coke contains 10 teaspoons of sugar (WHO, 2002) and is linked with an increased risk of obesity (Gavin, 2008).

These accurate and inaccurate health beliefs demonstrate the complexity of promoting a healthy lifestyle in children. It is important to identify the limitations of children’s understanding to ensure health promotion campaigns are developmentally appropriate (Maddux, Roberts, Sledden & Wright, 19986). Thus, interventions aiming to promote a healthy lifestyle in children should ensure guidelines are clear in behavioural terms to support children’s understanding of what this means for their behaviour.

The second theme *‘Compensatory Health Beliefs’* evidenced that compensatory reasoning is not just an adult (Knauper, Rabiau, Cohen & Patriciu, 2004) and adolescent (Rabiau, Knauper & Miquelon, 2006) reasoning strategy, it is also a reasoning strategy that children employ. The analysis revealed CHBs were apparent across a range of behaviours that have been identified in the onset of obesity including: prolonged computer use (Eisenmann, Bartee & Wang, 2002), a high-sugar diet (Gavin, 2008), skipping meals (Rodearmel et al., 2006), fatty food consumption (Marshall, O’Donohoe & Kline, 2007) and insufficient sleep (Marshall, Glozier & Grunstein, 2008). Fruit and vegetable consumption, physical activity and brushing teeth were identified as key compensatory behaviours used to construct a CHB. Children identified varied functions of these health-protective behaviours including: compensating for excessive engagement with health-risk behaviour such as eating fruit to compensate for a high-sugar diet; compensating for the lack of engagement with health protective behaviours such as physical activity to compensate for not eating fruit and vegetables; and to neutralise behaviour such as drinking water to ‘flush out’ the fizz from drinking coke. This demonstrates the complexity of children’s reasoning when negotiating healthy and unhealthy choices and identifying the different functional value of health-protective behaviour which at times can be used as a compensatory behaviour but at other times can be compensated for due to the lack of engagement e.g. fruit and vegetable consumption.

The data demonstrated a range of maladaptive, partially adaptive, and to a lesser extent adaptive CHBs in relation to levels of activity, diet and routine. Maladaptive CHBs are based on an incorrect belief that a healthy behaviour can compensate for an unhealthy behaviour and to engage in this type of reasoning has negative implications for long-term health (Rabiau, Knauper & Miquelon, 2006). Partially adaptive CHBs can compensate for some of the negative consequences of an unhealthy behaviour but cannot compensate for all of the negative consequences of behaviour and should also be avoided (Rabiau et al.). Adaptive CHBs identify a healthy behaviour which can accurately compensate for all of the negative consequences of an unhealthy behaviour, however, if an adaptive CHB is activated, a compensatory behaviour will need to be performed and this is dependent upon high levels of self-efficacy and implementation intentions to translate the compensatory belief into compensatory behaviour (Rabiau et al.). As children do not regulate all of their behaviour, adult support would be required to help children develop appropriate implementation intention plans (Wieber, von Suchodoletz, Heikamp, Trommsforr & Gollwitzer, 1999) in order to carry out the compensatory behaviour. This is an effortful cognitive strategy and as the use of CHBs is associated with poorer health outcomes in adults (Taut & Baban, 2008) it might be more appropriate to discourage this type of reasoning in children.

Children demonstrated compensatory reasoning consistent with the adult definition of a CHB, i.e. the negative consequences of an unhealthy behaviour can be removed, eliminated or neutralised by engaging in a healthy activity later (Knauper, Rabiau, Cohen & Patriciu, 2004). Children in this study demonstrated similar reasoning but used language such as ‘fade away’ and ‘cancel out’ to describe the process of compensations. Although use of language differed, the analysis revealed children hold the same CHBs as adults in relation to missing meals and sleep (Knauper et al.). CHBs based on consuming more food later in the day to compensate for missing breakfast or sleeping an additional number of hours to compensate for sleeping late were identified in this study. These CHBs are included in the adult CHB scale which suggests that compensatory reasoning could begin from a very early age and continue into adulthood.

The third theme *‘Influential Factors on CHBs’* revealed a number of internal and external influences which explain the development of compensatory reasoning. The development of compensatory reasoning could be best understood in terms of Bandura’s (1977) social cognitive theory which explains that children progress through interactions between their personal experience with the environment and behaviour, and gradually transition from being externally regulated through social and familial influences to acquire a sense of personal agency and knowledge about themselves that they can make things happen, thus progressing to personal control (Bandura, 1986). This developmental process of internal influences of the child interacting with the environment was identified as important for the development of compensatory reasoning in children and can contribute towards our understanding of how children develop CHBs that could remain with them in adulthood.

The range of internal influences on children’s compensatory reasoning demonstrate the complexities and interactive nature of children’s cognitive capabilities to identify compensatory behaviour which develop and progress as children become older and have increased opportunities to self-regulate. This is illustrated in the current study with only the youngest children in this study demonstrating moral compensatory reasoning in relation to ‘good’ and ‘bad’ behaviour during a discussion of healthy and unhealthy food. This is in line with Bibace and Walsh’s (1979) categorisation that children at this age are unable to differentiate the mind and body and identify functional equivalence of immoral behaviour with dirt and germs in terms of illness. Children’s reasoning could develop and progress from moral reasoning which is a broad concept to compensatory reasoning of more specific healthy and unhealthy lifestyle behaviours. Children engage in the process of food categorisation to identify the functional value of food as having ‘good’ and ‘bad’ properties (Oakes, 2005). Therefore, moral reasoning could precede compensatory reasoning in the development of constructing CHBs. As children become older their developing complexities of understanding can be demonstrated with a wider range of CHBs across an increased number of health domains. Developing complexities exist for health and illness concepts based on children’s age and experience (Myant & Williams, 2005) and the findings of this study indicate similar developing complexities could exist in relation to children’s compensatory reasoning.

Children’s cognitive capabilities include the ability to self-regulate (Bandura, 1977) and in this study, children identify a range of strategies to modify their behaviour. Children demonstrate the ability to engage in self-control based on self-monitoring which results in behavioural outcomes such as turning the television off or going outside to play to prevent being inactive. Children with the capacity to self-regulate physical activity and dietary behaviour stay leaner in the transition to adolescence (Duckworth, Tsukayama & Geier, 2010; Tan & Holub, 2011). This can be explained based on an inhibitory control mechanism which is responsive to the external environment and aligns current thought and action (Logan, 1994). Children with poorer self-regulatory skills have a limited response inhibition which results in increased distractions and temptations within the environment (Bandura, 2004) leading children to engage in unhealthy behaviour. Children’s ability to self-regulate physical activity and dietary choices demonstrates that children have the ability to resist temptations presented in the environment. Resisting temptations is one of the strategies identified in the adult CHB model (Rabiau, Knauper & Miquelon, 2004) and is a behavioural strategy that children are also capable of.

Functional operations of the self-regulatory system are based on people’s beliefs about their capabilities to exercise control over events in their lives (Bandura, 1991), these are self-efficacy beliefs which are implicated in the development of a CHB. Children’s personal experiences of positively engaging in compensatory behaviours which are within their control could increase self-efficacy beliefs that they are capable of carrying out a compensatory behaviour. This could explain the reason fruit and vegetable consumption, physical activity and brushing teeth were identified as key compensatory behaviours as these are behaviours that children have experience of and some level of control in terms of access and participation. Negative experiences such as feeling unwell as a result of a high-sugar diet informs children’s outcome expectancy beliefs which could either lead them to avoid engaging in an unhealthy behaviour as their perception of risk is high (Weinstein, 1980) or could encourage activation of a CHB to minimise the anticipated conflict experienced based on a previous negative outcome of engaging in this behaviour. The latter can be explained based on the self-regulatory process which includes the ability to monitor behaviour and evaluate whether or not actions are effective, which leads to self-reaction and behavioural modification in response to these evaluations (Bandura, 1991). Thus children might be aware that engaging in sweet consumption could lead to feeling unwell and evaluate that engaging in compensatory behaviour could alleviate this feeling which results in sweet consumption. Alternatively, children could reason that compensatory behaviour cannot eliminate the negative consequences of sweet consumption and modify behaviour to resist temptations.

The concept of a CHB is that it is a motivated cognitive regulatory strategy that is activated to alleviate cognitive dissonance that arises when faced with temptations that could compromise health goals (Knauper, Rabiau, Cohen & Patriciu, 2004). According to the adult literature CHBs are likely to be activated when individuals hold health goals that are regulated extrinsically in terms of introjected regulation, that is, to avoid shame and guilt (Rabiau, Knauper & Miquelon, 2006). CHBs are unlikely to be activated in adults that hold externally regulated health goals and instead are more likely to not resist the temptation or change the outcome expectancies of behaviour (Rabiau et al.). The nature of children’s motivation associated with compensatory reasoning may differ as children’s behaviour is regulated both internally and externally (Bandura, 1986). Children in this study demonstrated a clear desire to indulge in sweet consumption but based on externally imposed behavioural standards which discourage a high-sugar diet (Department of Health, 2005), a conflict may occur which is not related to internalised health goals, rather a conflict occurs in the external environment and CHBs are used to facilitate access to desirable but unhealthy snacks, e.g. reasoning with parents that if sweets are consumed they will brush their teeth extra well that night. Negotiations using CHBs could alleviate any dissonance that occurs as a result of parental control strategies and result in consumption of unhealthy snacks.

The data demonstrates children identify health goals which may cause a motivational conflict to arise, similar to adults when faced with unhealthy but tempting choices and could lead to the activation of CHBs to minimise any conflict experienced. It is worth exploring whether the nature of conflict children experience in relation to compensatory reasoning differs from adults in order to understand the developmental process of compensatory reasoning. However, exploring children’s motivations was not the aim of this programme of research and future research could explore the nature of children’s motivational conflict in relation to compensatory reasoning and the implications this has for behaviour.

The internal reasoning processes which influence the construction of a CHB can be understood in terms of: developing complexities with age and experience to engage in compensatory reasoning; food categorisation to identify appropriate compensatory behaviours; and self-efficacy and self-regulatory processes which inform children’s beliefs that they are capable of performing compensatory behaviours. These internal processes develop based on children’s experiences with the external environment (Bandura, 1991). This study identified a range of external influences on the development of children’s CHBs based on family and social influences. Compensatory reasoning is activated based on behaviour within volitional control (Rabiau, Knauper & Miquelon, 2006) and parents in this study appear to facilitate access to a range of unhealthy snacks for children. The largest number of CHBs identified in this study was in relation to unhealthy snack consumption and this could result from parental access to these items thus it becomes a behaviour within children’s volitional control.

Family influences on the construction of CHBs could be based on learning behaviour via role modelling (Bandura, 1991) of the positive outcomes of engaging in health protective behaviours and the negative consequences of engaging in health risk behaviours. Research has identified the importance of parental role modelling for healthy eating and physical activity (Golan & Crow, 2004; Lindsay, Sussner, Kim & Gortmaker, 2006) with children more likely to eat healthy food and engage in physical activity if their parents model these behaviours in their environment. It is therefore important to ensure children’s familial environment does not encourage compensatory reasoning by modelling this type of behaviour.

Children were also recipients of social influences in both an obvious and also more subtle manner. Children discuss peer and media influences which inform their attitudes towards health risk and health protective behaviour of sweets and fruit and vegetable consumption. Negative consequences of sweet consumption resulting in tooth loss were negatively evaluated based on peer influence and rejection and is consistent with previous literature which identify peers and friends as having an important role in developing children’s attitudes (Houldcroft, Haycraft & Farrow, 2014). The role of media influences was apparent as children identified Change4Life campaigns inform their beliefs around fruit consumption. The role of social learning from each of these social influences is well-documented and is utilised in health promotion campaigns to promote a healthy lifestyle (National Obesity Observatory, 2014). Children’s beliefs were also susceptible to more subtle social influences based on the structure of the environment such as the school day which models sedentary and active periods. This highlights the importance of ensuring a healthy lifestyle is modelled not just at an individual level but also at an environmental level.

A multitude of influences inform the construction of a CHB in children based on an interaction between internal and external influences. The model below depicts a visual illustration of the internal and external influences identified in this study which inform the development of a CHB:

Age

Categorisation

Past Experience

Self-efficacy

Self-regulation

Desire

Health goals

Motivation

CHB

*E.g. maladaptive, partially adaptive, adaptive*

Family

School

Media

*What happens here with children?*

Self-efficacy

Motivation

Implementation Intentions

Role Modelling

Discourse

Environmental Structuring

***Figure 6.***Internal and External Factors Influencing the Construction of a Child-CHB

The model depicts the range of influences that are implicated in the construction of a CHB as discussed. Rabiau, Knauper and Miquelon (2006) propose that once the CHB has been activated it requires the creation of an implementation intention (Gollwitzer, 1999) to actually perform the compensatory behaviour. After this plan has been developed individuals have the choice of carrying out the compensatory behaviour or not. Individuals that think they are capable of carrying out the compensatory health behaviour specified in their CHB plan will carry it out and reduce the motivational conflict experienced as individuals believe that they have erased or neutralised the negative effects of the unhealthy behaviour. However, there is a possibility that over time dissonance weakens and the compensatory behaviour will not be performed (Rabiau et al.). If children use CHBs then they will require support to develop effective implementation intentions in order to carry out the compensatory behaviour effectively.

Previous research has identified CHBs in adolescents are negatively associated with health behaviour including lower intentions to: quit smoking (Radtke, Scholz, Keller & Hornung, 2011), engage in physical activity (Berli, Loretini, Radtke, Hornung & Scholz, 2014) and maintain adherence to health care behaviour in relation to diabetes (Rabiau, Knauper, Nguyen, Sufrategui & Polychronakos, 2009). CHBs are negatively associated in adults in terms of weight regulation in dieters (Miquelon, Knauper & Vallerand, 2012) and dietary nutrition in coronary heart disease patients (Taut & Baban, 2008). It is unclear whether children engage in compensatory behaviour or whether this reasoning strategy is associated with poorer health outcomes, as this was not the aim of this programme of research.

If children use CHBs to justify low levels of physical activity and an unhealthy diet, these behaviours will need to be targeted in future health campaigns which aim to promote a healthy lifestyle. Health awareness campaigns could either discourage or challenge the use of maladaptive CHBs or they could encourage children to develop adaptive CHBs which can effectively compensate for unhealthy behaviours, although the latter approach will need to be considered with caution as activating CHBs is an effortful strategy which will require additional cognitive resources in order to carry out the compensatory behaviour.

This study has identified that children hold CHBs across a number of health domains. Whilst the FGs provided a rich dataset, a limitation of this study is that adopting a FG design with children who have an existing social network could have run the risk that children adopted themes identified by others in the group rather than offering their own opinion. However, children in the draw-and-talk study identified similar CHBs in relation to diet and activity which strengthen the current findings and confirm that children hold CHBs in relation to behaviours implicated in a healthy lifestyle.

Future research will need to explore children’s use of CHBs in order to assess whether this type of reasoning is associated with poorer health outcomes and to identify whether this type of reasoning can be modified in order to promote a healthy lifestyle. In order to do this, a measurement tool will be required to capture the strength of compensatory reasoning which can support future research and health interventions.

**CHAPTER 5**

**Initial development, reliability and validity testing of the Child Compensatory Health Beliefs (C-CHB) scale**

**5.1 Introduction**

Children have the cognitive capacity to hold CHBs in relation to a number of behaviours that have implications for a healthy lifestyle (see chapters 3 and 4). Identifying compensatory reasoning in children is a relatively new construct that needs to be researched further in order to understand its theoretical relevance and implications for behaviour in relation to treatment and prevention of obesity. Adult research into CHBs suggests this type of reasoning has negative implications for long-term health as CHBs are linked to poorer health outcomes and should be discouraged from use (Knauper, Rabiau, Cohen & Patriciu, 2004; Radtke, Scholz, Keller & Hornung, 2011). It is unclear whether this type of reasoning has negative implications for children’s health. Chapter 4 revealed that children did not identify many adaptive CHBs but offered a range of maladaptive and partially adaptive CHBs. Maladaptive and partially adaptive CHBs involve the construction of a CHB based on behaviours that cannot neutralise the negative consequences of indulging in an unhealthy behaviour. These beliefs need to be understood further in order to either correct maladaptive and partially adaptive CHBs, or, if CHBs are associated with poorer health outcomes in children, to discourage the use of CHBs and instead encourage children to resist the temptations they experience in relation to unhealthy lifestyle choices.

A measurement tool capturing the strength of children’s compensatory reasoning could support this research and could offer a baseline measure for interventions that seek to modify this type of reasoning. It would also support future research to explore CHBs in relation to other constructs in order to understand whether CHBs have a positive or negative relationship with psychological and environmental factors. A number of scales have been developed measuring CHBs in adults and adolescents. Knauper, Rabiau, Cohen and Patriciu (2004) developed a 17-item scale measuring CHBs in an adult sample aged 18-50 years. They identified four factors in the scale including substance use, eating/sleeping habits, stress, and weight regulation. This scale cannot be used with a child population due to inclusion of CHBs relating to health behaviours that are not applicable to, nor appropriate for children such as: *“The effects of drinking alcohol can be made up for by eating healthy”*; *“Smoking can be compensated for by exercising”*; and *“It’s alright to drink a lot of alcohol as long as one drinks lots of water to flush it”*.

Behaviour specific CHB scales have also been developed for alcohol consumption (Rahal, Bryant, Darkes, Menzel & Thompson, 2012), smoking (Radtke, Scholz, Keller, Knauper, & Hornung, 2011) and nutrition (Poelman, Vermeer, Vyth, & Steenhuis, 2013). These scales cannot be used to measure children’s CHBs as they have been developed and validated for an adult and adolescent population and the CHBs included in these scales are for behaviours that are not usually associated with children aged between 7-11 years. Therefore, development of a scale measuring children’s CHBs is required in order to support future research and potential interventions targeting CHBs in a child population.

The specific construct that the child CHB scale will measure is compensatory reasoning in relation to behaviours that have implications for a healthy lifestyle. As outlined in chapter 4, children hold a range of CHBs in relation to physical activity and screen time, dietary behaviour including food and drink consumption, and aspects of their daily routine relating to meal times, brushing teeth and sleep. The child CHB scale will include measures of compensatory reasoning for each of these behaviours. The child CHB scale is intended to obtain a general measure of CHBs across a number of health domains and to capture the strength of compensatory reasoning in children.

Chapters three and four show that whilst children as young as five demonstrate compensatory reasoning, their limited cognitive-development suggests it would be difficult to quantify this type of reasoning. Compensatory reasoning in children aged five and six is possibly a state like trait which varies as a function of the environment as children do not have a lot of control over their diet and activity. Children aged seven onwards demonstrate more consistent compensatory reasoning across a wider range of health domains. In addition, cognitive limitations in children aged five and six such as language development, literacy and memory could potentially affect a child’s ability to answer a survey questionnaire well, as these processes are still developing, whereas there is general agreement that survey research is feasible with children aged seven onwards (Bell, 2007). The intended population using this measurement tool is therefore children aged 7-11 years.

Understanding CHBs in a child population is in an exploratory phase. As there is no published research available in this area it is difficult to determine the nature of the convergent and divergent relationship of compensatory reasoning with other psychological constructs prior to testing. A validation study was therefore conducted in order to understand this further and the child CHB scale was explored in relation to a number of variables with tentative, hypothesised relationships including: measures of convergent validity where a positive association is assumed to exist between the tendency to hold CHBs and intention, volition and self-efficacy; divergent validity was assessed by including measures of anxiety and body dissatisfaction which assume there will be no association with the tendency to hold CHBs. It is difficult to determine the nature of the relationship between behavioural outcomes in terms of diet, physical activity and knowledge due to the exploratory nature of this research but these constructs and outcomes were measured to assess the C-CHB’s construct validity.

The aims of this chapter were to:

* Develop a scale to measure CHBs in children;
* Assess the dimensionality and initial reliability of the scale;
* Assess temporal stability and preliminary validity of the scale.

**5.2 Item Generation Phase**

The aim of this phase of the study was to generate an initial item pool from which an initial scale measuring CHBs in children aged 7-11 years would be created.

*5.2.1 Methods*

*Latent variable*

In this programme of research, the latent variable was children’s compensatory reasoning as this involves cognitive beliefs that cannot be directly observed, and is variable in strength as compensatory reasoning might increase or decrease depending on a range of factors at the time such as motivation or health goals.

The item generation phase sought to generate items that reflect the construct. The adult CHB model offers a simple and well-formulated definition of CHBs that guided the development of items measuring children’s CHBs. Data from the focus group (FG) discussions (see chapter 4 for more information) were used to generate initial items for the child CHB scale as children were asked directly about their experience and opinions of CHBs. According to Pesudovs, Burr, Harley and Elliot (2007) this is a key approach that should be undertaken in order to generate items of relevance. This approach generated 121 items. Data from the draw-talk study (see chapter 3) was also examined to identify further CHBs but no additional items were identified from this study that could be included in the initial item pool. A pilot study, not reported here, which involved one FG discussion with children aged between 5-11 years and an open ended parental questionnaire exploring CHBs in children, generated a further 20 and 42 items respectively (see Appendix I).

As per Pett, Lackey and Sullivan’s (2003) guidelines the transcripts were read and reread. Significant words, phrases and statements were extracted and meanings were then derived for each word, phrase or statement and organised into either individual items or categories of items that represent a CHB. Examples include: *“It’s ok to go out and get fresh air when you’ve been on the computer for a long time”* (generated from FG data), *“It is fine to eat fried food as long as I go for a jog or do some skipping”* (generated from pilot FG with children) and *“If she has something unhealthy she says she’ll eat all her dinner and drink lots of milk”* (generated from pilot parental questionnaire data).

Three items from published literature in the field were also included in the item generation pool. These were from the adult CHB scale: *“Too little sleep can be compensated for by sleeping in on the weekends”*; *“It is ok to go to bed late if one can sleep longer the next morning (only the number of hours count)”*; and *“It is ok to skip breakfast if one eats more during lunch or dinner)”* as these CHBs were also apparent during FG discussions conducted in study 2, which suggests they may be strong indicators of the underlying construct.

The initial item generation pool was deemed sufficiently complete and experts in the field were not contacted at this stage, in order to generate further items. Instead they were contacted at a later stage, during the scale validation process, which will be discussed later in this chapter and where experts were offered the opportunity to identify additional items that may be of relevance that had not been included.

The initial item generation pool comprised of 186 items (see Appendix I for items) stating CHBs in relation to a high-sugar and high-fat diet, low levels of physical activity, media-related activities such as television viewing and prolonged computer use, oral health, missing meals and sleep.

*5.2.2 Creation of Initial Child CHB Scale*

*Designing the scale*

Each of the items that were generated in the initial pool were then constructed into declarative statements following guidelines outlined in the methodology chapter (see chapter 2) which include avoiding double negatives, ensuring statements are short and relevant to the construct being measured.

Addressing redundancy and specificity resulted in removing 104 items from the scale. Some of the items were removed based on repetition and very specific CHBs such as *“taking the dog for a walk”* or stating an unhealthy food item by its brand such as *“coke”* were removed or modified. Not all children own a dog or drink coke but they may hold the same type of belief relating to energy expenditure of physical activity or they may drink other fizzy drinks. When identifying suitable items for inclusion in the scale, it was also important to ensure items weren’t too vague or ambiguous as this may result in children scoring negatively towards a CHB due to the way it was written, even though they may hold a positive belief.

The remaining 82 items in the item pool were then prepared as declarative statements on a five-point likert scale. The C-CHB scale included a 5 point likert scale with a ‘don’t know’ option at the mid-point, as fewer response options would restrict the item’s variance and a forced choice response might force children to agree or disagree with an item when in reality they don’t know, due to limited opportunities to develop CHBs in one particular health domain compared with another health domain where they might hold a CHB. Response options were: I disagree a lot, I disagree a little, I don’t know, I agree a little, and I agree a lot, and were used to measure the strength of children’s compensatory reasoning. Response options ranged from 1 – 5 with a high score indicating high levels of compensatory reasoning and a low score indicating low levels of compensatory reasoning. Each of the items sought to measure CHBs in relation to a number of lifestyle behaviours that were identified as contributing to obesity including: high-fat and high-sugar diet, low levels of physical activity, screen time, oral health, missing meals and sleep.

In order to help children manage the length of the initial scale, the 82 items were sub-divided into three sections based on activities, food and drink, and routine. To prevent children from becoming overwhelmed with text, colours were used in the design of the scale (see Appendix J)

The C-CHB scale included instructions on the first page for using the scale (Spector, 1992). Information on the purpose of the scale, and two neutral practice items were included, which gave children the opportunity to familiarise themselves with the response format as advised by Pett, Lackey and Sullivan (2003). As the scale was administered in a school setting where children may experience tests with right and wrong answers, children were reassured that there are no right or wrong answers.

*5.2.3 Face/Content Validity*

The 82-item scale was piloted on a number of experts to ensure the instructions, declarative statements and response options provided were clear. Experts included teachers, health psychologists, academics in psychology and education, parents and children. Each expert reviewer was provided with the background and definition of a CHB and asked to respond to the following four questions: 1) Is it an accurate reflection of the CHB construct? 2) Was the wording clear for children aged 7-11 years? 3) Should an item be deleted from the scale? 4) Is the response format clear? (see Appendices K & L).

All reviewers agreed that the 82-item scale was too long for children aged 7-11 years. Feedback from one parent included their child’s refusal to complete it based on the length of the scale alone. An academic in education advised against the use of traffic light colours in the likert scale as these colours are used in behaviour management and may affect children’s responses based on their interpretation of these items as good or bad based on behaviour and not representative of their beliefs.

In order to minimise the length of the scale, items which included specific terms such as TV, computer and DVD were removed and replaced with ‘screen time’. The same process was used to minimise specific examples of physical activity and unhealthy diets and were replaced with the terms ‘being active’ and ‘unhealthy snacks’. These broader terms were then included in standardised verbal instructions which are outlined in more detail in the following section. The traffic light system was removed from the scale but the three sections dividing activities, diet and routine were retained in order to help children cope with the remaining length of the scale.

A cognitive pre-test was also conducted with two children aged 7-9 years, which involved asking children to explain a random selection of items in terms of their meaning to ensure children’s understanding of the statement was in line with the intended meaning. No items were removed as a result of this process but the wording in certain sections was changed such as ‘section A’ changed to ‘part a’ to become more child-friendly. This review process resulted in a 39-item scale (see Appendix M).

The expert review process was engaged in again using the 39-item scale. Children, academics and teachers agreed that the refined scale and edited items were more acceptable for use.

**5.3 Item Reduction, Dimensionality and Reliability Phase**

The goal of this phase of research was to refine the C-CHB scale and demonstrate that it provides an internally consistent measure of children’s compensatory reasoning. Previous literature has identified sub-scales in adult measures of CHBs (Knauper, Rabiau, Cohen & Patriciu, 2004). Dimensionality of the C-CHB scale was explored to identify whether or not there are sub-scales within the general measure of CHBs. The items from the 39-item C-CHB scale were presented to a large group of school children.

Methods

*5.3.1 Participants*

All children in school Years 3-6 (aged 7-11 years) at a single primary school in the Midlands region were invited to complete the child CHB scale. A minimum sample size of 300 participants was sought as Tabachnick and Fidell (2007) advise this number of cases are required for factor analysis in order to obtain reliable correlation coefficients which can be affected by small sample sizes.

The participating school was a mixed-gender, rural primary school which, according to the school Ofsted report, is a much larger-than-average primary school with approximately 835 pupils at the school aged between 3-11 years. A very large majority of the pupils are from White British backgrounds and the proportion of pupils eligible for free school meals was below average. According to the Office for National Statistics 2011 census data, using the Index of Total Deprivation 2010 the neighbourhood this school was located in had an Index of Total Deprivation rank of 29786 out of 32482 (this falls in one of the least deprived neighbourhood categories in England).

The inclusion criteria included children aged between 7-11 years of age, the need for children to have sufficient literacy skills in order to understand each scale item and the ability to mark their answer on the scale. If a child was able to fully comprehend the scale items but unable to score the answer, it was acceptable to have a supporting member of staff score their response for them, but additional advice was sought from teaching staff to identify children that were unable to participate due to such difficulties.

Two children were opted-out of the study by their parents and six children used their right to withdraw at the beginning choosing not to participate in the research. A total of 384 children took part in this study but data from one child (aged 7 years) was removed from the dataset due to the heavy involvement of a teacher during completion of the scale based on the researcher’s observations during data collection. There was a fairly even gender split: 198 male (51.7%) and 185 female (48.3%) participants. The mean age was 8.68 years (S.D. =1.22, age range 7-11years).

*5.3.2 Procedure*

A school in the Midlands region was contacted and invited to participate in this study. A letter outlining the research rationale and detailing study requirements was sent to the school (see Appendix N). The head teacher of this school agreed for the research to be conducted but parental consent via an opting out system was also required. An opting out form (see Appendix O) was given to all children in Years 3, 4, 5 and 6, thus consent was obtained in *loco parentis.*

The 39-item C-CHB scale (see Appendix M) was administered to children in a group-based classroom setting. Over the period of one week, the scale was administered in 24 classes in Key Stage 2. Using developmentally-appropriate language, children were invited to participate in the study and informed of their right to withdraw (see Appendix P).

Prior to completing the scale, children were reminded of the purpose of the study and assured that it was not a test and that there were no right or wrong answers. Instructions to children on how to complete the scale adopted a standardised approach. The scale was read aloud and although each child completed it individually, they were encouraged to wait until each class member had scored their response before proceeding onto the next item, in order to complete the scale as a group.

The standardised scale administration approach included: explaining the rating scale to children, completing two practice items, and then giving children the opportunity to ask any questions they may have before proceeding to the standardised instructions (see Appendix Q). Standardised instructions were included so that items on the scale that refer to abstract behaviour became more meaningful and concrete for children. Prior to completing ‘Part A’ of the C-CHB scale, children were asked what ‘screen time’ and ‘being active’ involves and were given the opportunity to respond with their definition of these concepts. Their responses and any subsequent discussion were guided towards thinking about these terms in relation to watching TV, playing on the computer, watching DVDs for ‘screen time’ and physical activities, running, and sports for ‘being active’. Each of the nine items from Part A of the child CHB scale was then read aloud and children were asked to score their response for each item.

A similar approach was adopted when completing ‘Part B’ of the C-CHB scale (see Appendix Q). Children were guided to think about abstract terms such as ‘unhealthy snacks’ in terms of sweets, chocolates, biscuits and cakes due to their sugar, fat and highly calorific content. Each of the 18 items from Part B was then read aloud and children were asked to score their response for each item. Each of the 12 items from Part C on routine was read aloud and children were asked to score their response for each of these items. Children were not given any guidance when completing this section as it did not include any abstract terms that children would be unfamiliar with.

The scale took approximately 30 minutes to complete. Children were thanked for their participation and given a full debrief on the research aims (see Appendix P). They were reminded of their right to withdraw data up to one week after that day. Due to young children’s developing cognitive processes and limitations on memory capacity compared with adolescents, a one week withdrawal time period was deemed appropriate and easier for children to cope with than a longer time frame too far in the future for them to fully comprehend and be able to act upon appropriately in this instance. They were also given the researcher’s contact details in case they had any queries.

On completion of data collection, the participating school was given £100 of book vouchers as a thank you for the administrative support received and rearranging of timetables to accommodate the data collection process.

*5.3.3 Data analysis*

The data was analysed using PASW Statistics 18 (SPSS Inc. Released 2009).

*Missing data:* there were no items that had large percentages of missing data. The largest percentage of missing data was 1% (N=4) for the following item *“The sugar from fizzy drinks can be rubbed away by brushing teeth extra.”* This item was retained as the guidelines for excluding items with large percentages is defined by Pesudovs, Burr, Harley and Elliot (2007) at >50%.

Missing data were not replaced using estimation procedures. This was adopted in line with Tabachnick and Fidell’s (2007) guidelines in order to avoid overfit of the data or inflated correlations; instead missing data were treated pairwise and removed from the analysis only where data was missing for each specific analysis and included in any of the analyses for which they have the necessary information.

*Item Distribution:* Based on analysis of item distribution three items were removed due to high mean values. These items were:

1) *If you walk to school you don’t need to do any other exercise that day* (mean=4.39)

2) *Brushing teeth twice tomorrow can make up for not brushing teeth today* (mean=4.36)

3) *It is ok to not brush teeth as long as you drink water to wash away the bad effects* (mean=4.31).

These items suggest responses were limited with a high number of respondents disagreeing with the item statement. All remaining items demonstrated sufficient variability in scores with Skewness and Kurtosis values within -2.00 to +2.00 demonstrating appropriate normal distribution (Pesudovs, Burr, Harley & Elliot, 2007) and were retained for further analyses (see Appendix R).

The C-CHB scale was analysed using a principal axis factoring (PAF) method of extraction using a Promax rotation (see chapter 2 for a discussion of factor analytic techniques and use of PAF method of extraction). It was reasonable to assume that the C-CHB scale might include sub-scales or factors which are correlated to some extent due to the nature of beliefs in relation to overlapping lifestyle behaviours, thus an oblique rotation was used in the development of the C-CHB scale. Items were retained based on Tabachnick and Fidell’s (2007) guideline that .32 is acceptable for a minimum loading of an item, which equates to approximately 10% overlapping variance with the other items in that factor.

*5.3.4 Results*

The 36 items were subjected to a PAF using a promax rotation, suppressing values less than .3, on the full sample of N = 383. Missing values were treated pairwise. Prior to performing PAF, the suitability of data for factor analysis was assessed. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .84, exceeding the recommended value of .6 (Kaiser 1970, 1974) and Bartlett’s Test of Sphericity (2827.283, *df* = 561, *p* < 0.001) reached statistical significance, supporting the factorability of the correlation matrix. Inspection of the correlation matrix table (see Appendix S) revealed 36 significant (p < .001) correlation coefficients of .3 and above which also suggests factor analysis is an appropriate test on this data (Pallant, 2007). Inspection of the anti-image correlation matrix (see Appendix T) indicates high values for individual measures of sampling adequacy (MSA) ranging from .703 to .902 which according to Kasier’s (1974) criteria indicates acceptable MSA coefficients.

To determine the number of factors to extract, Kaiser’s criterion of eigenvalues greater than 1 was used (Pallant, 2007; Tabachnick & Fidell, 2007). Ten factors with eigenvalues greater than 1.0 were extracted from the matrix explaining 56.13% of the total variance. As the Kaiser criterion tends to overestimate the number of components to extract (Pallant) the scree plot (see Figure 7) was also inspected which offers an indication of the number of factors to retain by looking for a change in the shape of the plot (Pallant). Figure 7 demonstrates the ‘break’ and ‘levelling off’ is at factor 4 which suggests three factors should be retained explaining 30.76% of the total variance. An oblique rotation (Promax) was then performed on three factors to simplify and clarify the data structure, thus improving interpretability.



***Figure 7.*** Scree plot

The factor correlation matrix resulting from the PAF shows that the factors correlate well (see Table 7) with correlations ranging from *r* = .21 to *r* = .49. This supports the decision to use oblique rotation as the factors appear to have shared variance.

**Table 7.**

*Factor Correlation Matrix*

|  |  |  |  |
| --- | --- | --- | --- |
| Factor | 1 | 2 | 3 |
| 1 | 1.00 |  |  |
| 2 | .494 | 1.00 |  |
| 3 | .208 | .458 | 1.00 |

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

Based on the analysis of the loadings of the rotated factors, 29 items with factor loadings above 0.32 (Tabachnick & Fidell, 2007) were retained. Factor loadings ranging from .327 to .772 across three factors are outlined in Table 8.

*Factor Labelling*

Inspection of the factor structure matrix, which some argue should be the one used for interpretation (Pett, Lackey & Sullivan, 2003), indicates that factor one item loadings all relate to daily activities such as meal times, brushing teeth and sleep, and as a result is labelled ‘Routine’ (Table 8).

Factor two item loadings are largely in relation to diet but two items (items 11 and 12) have loaded onto this factor but relate to activity. For the factors to have conceptual meaning, which many authors advise (Pett, Lackey & Sullivan, 2003), items 11 and 12 on factor two, were moved to factor three as these items all related to ‘Activity’ which has been labelled accordingly. Item 21 loaded onto both factors two and three. Due to the theoretical relevance of item 21 being related to a dietary CHB, it was retained on factor two which has been labelled ‘Diet’.

Factor three item loadings are largely in relation to activity. However, two items (items 26 and 29) have loaded onto this factor but are in relation to diet. Inspection of the factor structure matrix indicates there is shared variance between items 26 and 29 on factors two and three. As a result, these two items were moved to factor two.

Items should be examined to determine if it makes theoretical sense to retain them (Pett, Lackey & Sullivan, 2003). In doing so, researchers must be able to provide a conceptual explanation for how the target construct drives the variation in the behaviour described by the item. This is the rationale for moving items across factors as any variations in measures of each of the sub-scales (factors) could offer a conceptual explanation for variations in healthy and unhealthy lifestyle behaviours. Factor loadings on the C-CHB scale suggest items may need to be reworked or retested in a larger sample, but due to the early, exploratory nature of this research, items have been moved on the basis of content validity.

**Table 8.**

*Factor Loadings from the Pattern and Structure Matrix*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Pattern Matrix** | | | **Structure Matrix** | | |
|  | *Routine* | *Diet* | *Activity* | *Routine* | *Diet* | *Activity* |
| 1. It’s fine to miss a meal and not eat any food if an extra big meal was eaten earlier in the day | .475 | - | - | .488 | - | - |
| 2. Eating more at dinner can make up for not eating breakfast | .604 | - | - | .614 | .311 | - |
| 3. It’s ok to miss a meal as long as you eat a snack to make up for it | .481 | - | - | .517 | .313 | - |
| 4. A healthy snack like fruit can make up for not eating breakfast | .418 | - | - | .482 | .334 | - |
| 5. It is ok to not eat breakfast if a person eats more during their daytime or evening meal | .493 | - | - | .566 | .387 | - |
| 6. Brushing teeth extra good in the morning can make up for not brushing teeth at night | .521 | - | - | .582 | .377 | - |
| 7. Using mouthwash can make up for not brushing teeth | .482 | - | - | .463 | - | - |
| 8. Going to sleep early the next day can make up for sleeping late the night before | .503 | - | - | .425 | - | - |
| 9. It is ok to go to bed late if you can sleep longer next morning (only the number of hours count) | .600 | - | - | .508 | - | - |
| 10. Sleeping in at the weekend can make up for too little sleep during the week | .355 | - | - | .365 | - | - |
| 11. As long as you’ve done something active, it’s ok to have screen time for the rest of the day | - | .352 | - | - | .395 | - |
| 12. Being active a lot at the weekend makes up for not being active on school days | - | .426 | - | .399 | .477 | - |
| 13. Healthy food rubs away the fat and sugar in unhealthy snacks | - | .475 | - | - | .525 | .363 |
| 14. Eating extra fruit can take away the sugar in sweets | - | .436 | - | - | .485 | .401 |
| 15. It’s OK to eat sweets as long as you brush your teeth extra that day | - | .387 | - | .328 | .520 | .381 |
| 16. Rinsing your mouth out after eating sweets washes away the sugar | - | .606 | - | .415 | .634 | - |
| 17. Eating fruit can cancel out the extra calories in an unhealthy dinner | - | .478 | - | - | .526 | - |
| 18. Eating fried food is ok if you eat vegetables after to burn the extra calories | - | .342 | - | - | .455 | .340 |
| 19. A drink of water can wash away the sugar on teeth from fizzy drinks | - | .770 | - | - | .650 | - |
| 20. It’s ok to have one drink of coke if have two drinks of water | - | .476 | - | - | .490 | - |
| 21. The sugar from fizzy drinks can be rubbed away by brushing teeth extra | - | .325 | .340 | - | .469 | .484 |
| 22. Lots of screen time (looking at the computer, TV, videogames, DVDs) is fine as long as you do something active afterwards | - | - | .330 | - | - | .359 |
| 23. Going to sleep will stop your eyes from feeling tired after lots of screen time | - | - | .360 | - | - | .376 |
| 24. The sugar in your body from eating unhealthy snacks can be removed by being active | - | - | .497 | - | - | .439 |
| 25. Being active can cancel out the extra calories in an unhealthy snack | - | - | .430 | - | - | .387 |
| 26. Eating 5 portions of fruit and vegetables every day can rub away the extra fat in unhealthy snacks | - | - | .380 | - | .394 | .483 |
| 27. Being active can burn off the extra fat from an unhealthy dinner | - | - | .480 | - | - | .453 |
| 28. Being active can get rid of the sugar in your body from having a fizzy drink | - | - | .392 | - | .319 | .453 |
| 29. It’s ok to have a fizzy drink as long as you brush your teeth after | - | - | .432 | - | .422 | .533 |
| Eigenvalue  % variance explained |  |  |  | 6.150  18.087 | 2.597  7.638 | 1.711  5.033 |

*Reliability: Internal consistency*

The initial C-CHB scale was administered to a large sample in order to measure internal consistency reliability. High values of alpha were required to ensure that children’s interpretation of questions and the accuracy of their responses are consistent from one item to another (French, Christie & Sowden, 1994).

An analysis conducted on the 29 item scale demonstrates excellent internal consistency (α = .852). The highest inter-item correlation was *r*=.498 with a large number of inter-item correlations clustered between *r*= 0.1 – 0.2 (see Appendix U), indicating that the retained items are sufficiently differentiating and not redundant with one another. Split-half reliability measures also indicate the scale has good internal consistency with part 1 (15 items) α = .769 and part 2 (14 items) α = .784. The Spearman-Brown coefficient = .722 and Guttman Split-Half coefficient = .721 suggesting the overall C-CHB scale is a reliable measure.

The internal consistency values for each of the subscales were good (Factor one ‘routine’ α = .770; Factor 2 ‘diet α = .809) apart from activity (α = .545).

The internal consistency value for the original factor two, prior to moving two items, was lower (α = .797) but the original internal consistency value for factor three, prior to moving two items, was higher (α = .647). Item-total statistics were inspected and each item contributed to the overall reliability of the scale as Cronbach’s alpha if each item was deleted did not increase. Thus the 29-item C-CHB scale is a reliable measure of general compensatory reasoning with three sub-scales measuring CHBs in relation to routine, diet and activity.

**5.4 Test-retest and Validity Phase**

The temporal stability of the C-CHB scale was assessed with the same participants across two different time-points, three weeks apart. The test-retest time interval was three weeks in order to avoid true changes to the latent variable and to ensure sufficient time has passed so that children did not remember their responses. The scale’s convergent validity was also assessed in terms of intention, volition, knowledge and self-efficacy; and the scale’s divergent validity in terms of anxiety and body dissatisfaction. Behavioural outcomes in terms of diet and activity were also included to assess the relationship between these factors and the tendency to hold CHBs but no hypothesised relationship was offered due to the exploratory nature of this research.

5.4.1 Methods

*5.4.1.1 Design*

A questionnaire design was employed at two different time points. At time one children in years 3, 4, 5 and 6 at a single primary school were asked to complete a series of measures (see Measures section 5.4.1.3) in order to assess the C-CHB scale’s construct (convergent and divergent) validity.

Time two administration of the C-CHB scale was three weeks after time one administration of the C-CHB scale.

*5.4.1.2 Participants*

A total of 142 children participated in this validation study. The age range was 7-11 years (Mean =8.64; SD =1.30) with slightly more male =77 (54.2%) than female participants =65 (45.8%).

At time one N=130 participants took part in the study with 70 male (53.8%) and 60 female (46.2%) children (mean age = 8.67; S.D. = 1.30). At time two N =130 participants took part in the study with 72 male (55.4%) and 58 female (44.6%) children (mean age = 8.62; S.D. 1.29).

The participating school was a mixed-gender, urban primary school with approximately 308 pupils aged between 4-11 years. According to the school Ofsted report this is a larger than average sized primary school. The proportion of pupils from ethnic minority backgrounds is above average and the proportion of pupils eligible for free school meals is approximately twice the national average. According to the Office for National Statistics 2011 census data, using the Index of Total Deprivation 2010 the neighbourhood this school was located in had an Index of Total Deprivation 2010 rank 16241 out of 32482 which is ranked in between the least and most deprived neighbourhoods.

The inclusion criteria included children aged 7-11 years of age, the need for children to have sufficient literacy skills in order to understand each scale item and to mark their answer on the scale. If a child was able to fully comprehend the scale items but unable to score the answer, it was acceptable to have a supporting member of staff score their response for them, but additional advice was sought from teaching staff to identify children that were unable to participate due to such difficulties.

*5.4.1.3 Measures*

A number of self-report scales were selected for inclusion in the validation study. The measures were selected on the basis that they were all self-administered, short and concise, and were appropriate to use with a non-clinical sample. Not all of the psychometric properties of the measures were known as some of the items were created or modified specifically for the purpose of this study. Where reliability measures were known they are reported otherwise left blank. Reliability tests were also carried out on the sample used for this current study. The measures included in this validation study, in addition to the C-CHB (see Appendix V), were:

*1) Children’s Food and Activity Questionnaire (CFAQ)*. This questionnaire was based on the Coordinated Approach to Child Health (CATCH) Kids Club After-School Student Questionnaire (ASSQ) (Kelder, Hoelscher, Barroso, Walker, Cribb & Hu, 2005).The ASSQ survey was developed for a programme called the CATCH Kids Club (CKC). Measures were conducted with after-school students to assess nutrition behaviours, attitudes and knowledge. This is a 58-item questionnaire and includes psychosocial outcome measures of self-efficacy (nutrition / physical activity), intentions (nutrition / physical activity) and knowledge (nutrition); behavioural outcomes of TV / Video game watching on previous day, and intake of marker foods on previous day; student demographics including age, gender and ethnicity (see Appendix W).

Permission was sought by staff on the CATCH programme to use the ASSQ for the purpose of this research. Some of the items were modified to make them culturally appropriate e.g. candy bar changed to chocolate bar. Some of items were excluded as it was felt children would not understand the question due to unfamiliar terminology e.g. *do you ever eat a high fibre cereal?*, and other items were included in order to obtain UK appropriate measures of accurate knowledge e.g. *how much physical activity should you do each day?*. The response option was also altered from a rating scale to include open-ended responses for a number of questions (see Appendix X). The revised scale is subsequently labelled the Children’s Food and Activity Questionnaire (CFAQ) and was divided into four parts (A-D):

Part A:

1. Current dietary behaviour (Q1-9b): A measure of current dietary behaviour was sought by asking children to score: the number of French fries/chips; crisps, sweets and/or chocolate; vegetables; beans and pulses; fruit; fruit juice; biscuits, doughnuts, cookies, brownies, pies/cake; and fizzy drinks they had consumed the day before. They were also asked to write down what they usually have for breakfast; and whether they had missed breakfast this week. Scores on these items ranged from 2 – 5. High scores on these items relate to positive dietary behaviour which indicates healthy dietary behaviour and low scores on these items relate to negative dietary behaviour which indicates unhealthy dietary behaviour. These values were calculated together to obtain a total current dietary behaviour score, with higher scores indicating more positive dietary behaviour.
2. Current levels of activity (Q10-15): A measure of current activity levels included asking children to score their participation in a range of activities including: moderate to vigorous activity; the number of television shows/videos/DVDs watched per day during the week; and also per day at the weekend; the number of hours spent on the computer per day during the week; and also at the weekend; and to write the activities they spend a lot of time doing at the weekend. Scores ranged from 1 – 3 with high scores. The values were summed to obtain a total current activity behaviour score ranging from 6-17, with higher scores indicating more healthier levels of activity.

Part B:

1. Knowledge (Q16-26): Knowledge in relation to diet (eight items) was assessed using dichotomous scoring. Children were given a selection of healthy and unhealthy food choices and asked to circle the picture that they considered to be better for their health. Food choices included: whole wheat bread/white bread; cereal/eggs and bacon; beef/beans; chicken/regular hamburger; regular milk/low fat or skimmed milk; green salad/French fries; French fries/baked potato; 100% fruit juice/fruit drink. Three open-ended questions were also asked: *how many portions of fruit and vegetables should you eat each day; how much physical activity (being active) should you do each day; and how much screen time (things like watching TV, playing on the computer, DVDs) is it ok to have in one day?*  With the latter two items measuring activity knowledge. Correct responses to each of these items were scored 2 and incorrect responses were scored 1. Individual scores were summed resulting in a higher value indicating accurate knowledge.

Part C:

1. Intention (Q27-32): Intention was measured by asking children to select one of two food choices (healthy and unhealthy) when faced with a scenario only permitting one option. These include: Snack choices of either a chocolate bar or fresh fruit; choice of either French fries or baked potato if going to help cook dinner at home; when eating cooked vegetables, whether they would eat the vegetables without butter or if they would add butter; and which would you order if you were going to eat at a fast food restaurant, either a regular hamburger or a grilled chicken sandwich. The healthiest response to each of these items was scored a 2 and the unhealthiest choice was scored a 1 (original scale α = .76-.78; current scale α = .51).

In order to measure intention children were also asked to score responses to two items on a five-point likert scale: *I will try to eat five portions of fruit and vegetables every day; and I will try to be active for at least 60 minutes (one hour) every day*. Permission was sought from researchers that had included this item in a previous study measuring children’s fruit and vegetable consumption (Gratton, Povey & Clark-Carter, 2007). The second item was created for the purpose of this study. The response options ranged from 1-5 with 1= very unlikely, 2= unlikely, 3= don’t know. 4= likely, 5= very likely. Higher scores on each of these responses indicate a stronger intention to engage in healthy behaviour. Each of the scores were summed and a higher score indicated a higher intention to engage in healthy behaviour.

1. Dietary Volition (Q33-37): Volition was measured using dichotomous response options asking whether children choose or fix: their own food for breakfast; lunch on school days; food at the supermarket; what they want to eat for dinner; and snacks. Responses were scored Yes = 2 and No = 1 with higher scores indicating increased dietary volition.

Part D:

Self-efficacy was measured on a three-point scale with options ranging from: not sure, a little sure, or very sure, scored 1, 2, or 3 respectively for both dietary self-efficacy and physical activity self-efficacy. Higher responses indicate high self-efficacy.

1. Dietary Self-efficacy (Q38-41): Items include: if you could have either cereal or a donut, how sure are you that you can eat cereal instead of a donut; if you had fruit and sweets/chocolate in front of you, how sure are you that you can eat fresh fruit instead of sweets or a chocolate bar; if you had fruit juice and fizzy drinks at home, how sure are you that you can drink fruit juice instead of a fizzy drink; and how sure are you that you can eat cooked vegetables instead of fried food (current scale α = .70).
2. Physical Activity Self-Efficacy (Q42-45): Items include: At break time how sure are you that you can play active games (such as running around) everyday; how sure are you that you can be active every day; how sure are you that you can exercise and keep moving for most of the time in P.E; and if you can play active games which involve lots of moving such as running, biking or other active games and you could also play on the computer, how sure are you that you can choose to play active games instead of sitting down on the computer (current scale α = .70).

*2) Spence Children’s Anxiety Scale (SCAS) Generalised anxiety measure* (see Appendix Y): The Spence Children’s Anxiety Scale (Spence, 1994) assesses six domains of anxiety including generalized anxiety, panic/agoraphobia, social phobia, separation anxiety, obsessive compulsive disorder and physical injury fears. In this validation study however, only six items that measure generalised anxiety disorder were used. The adult CHB model stipulates activating CHBs can alleviate cognitive dissonance that arises from anticipatory guilt. Anxiety may be a pre-cursor to anticipatory guilt but it is unclear how this may be related to children, hence inclusion of the generalised anxiety subscale.

Children were asked to rate the degree to which they experience each symptom on a 4-point frequency scale ranging from never (0), sometimes (1), often (2), and always (3), the frequency with which they experience the following symptoms: *I worry about things; When I have a problem, I get a funny feeling in my stomach; I feel afraid; When I have a problem, my heart beats really fast; I worry that something bad will happen to me; When I have a problem, I feel shaky.* A higher score indicated increased feelings of anxiety (current scale α = .71).

*3) Kids Eating Disorder Survey (KEDS)* *Body Dissatisfaction Scale* (Childress, Brewerton, Hodges & Jarrell, 1993) (see Appendix Z): A measure of body dissatisfaction was obtained by asking children to complete the final two questions from the Kids Eating Disorders Survey. Children were presented with eight male and female silhouettes numbered from 1-8. The silhouettes vary in size from a very thin body frame to an overweight body frame. Children were asked: “*Circle* the drawing that *most looks like you*, then *underline* the drawing you *would most like to look like.”*  The number obtained from the underlined drawing (the desired figure) was subtracted from the number obtained from the circled drawing (perceived figure) to get the difference. If the difference was ≤ 2, then the body dissatisfaction score = 0; if the difference was 3, then the score = 1; if the difference was ≥ 4, then the score = 2. A higher score indicated increased feelings of body dissatisfaction.

*5.4.1.4 Procedure*

A school in the Midlands region was contacted and invited to participate in this study. A letter outlining the research rationale and detailing study requirements was sent to the school (see Appendix AA). The head teacher of this school agreed for the research to be conducted but parental consent via an opting out system was also required. An opting out form (see Appendix AB) was given to all children in Years 3, 4, 5 and 6, thus consent was obtained in *loco parentis.*  None of the children were opted out of the study.

Using developmentally-appropriate language, children were invited to participate in the study and informed of their right to withdraw (see Appendix AC). Prior to completing the scales, children were reminded of the purpose of the study and assured that it was not a test and that there were no right or wrong answers. Instructions to children on how to complete the scales adopted a standardised approach. The scale was read aloud and although each child completed it individually, they were encouraged to wait until each class member had scored their response before proceeding onto the next item, in order to complete the scale as a group.

At time one children were invited to complete the CFAQ. Upon completion of the CFAQ children were given a five minute break during which they were encouraged to stand up and shake their body in order to help fight the fatigue from completing a large questionnaire. They were then give the C-CHB scale followed by another five minute break where they could colour in, again this was to fight the negative effects of completing lots of items and in order for them to be cognitively alert as they are more likely to score accurately instead of being bored or tired when completing the remaining questionnaires. Children were then asked to complete the anxiety and BDS scale.

The scales were administered in a group setting. The researcher read each item aloud, followed the same standardised instructions when completing the C-CHB scale and encouraged children to wait for each class member to complete their score before moving on to the next item or questionnaire.

Approximately three weeks later, children from the same classes were invited to complete the C-CHB scale only following the same standardised instructions (see Appendix Q) that were used at time-one.

All children that attended school on the day of the scale administration were invited to complete the scale at both time points but data obtained from children at time two, that were absent at time one, was excluded from the analysis. Children were invited to participate to maintain positive well-being and an inclusive environment within the school and to ensure children did not feel excluded from the class activity.

On completion of data collection, the participating school was given £100 of book vouchers as a thank you for the administrative support received and rearranging of timetables to accommodate the data collection process.

*5.4.1.5 Data analysis*

A missing-values analysis of the questionnaire data showed that no variable had more than 5% of missing cases with the exception of Q9b on the CFAQ, which had 64.3% missing values. This question only required a response if children had missed breakfast that week and indicates that 64.3% of children had not missed breakfast that week. Therefore, it was not of concern and was not deleted from the analysis. Missing values in the data were treated pairwise.

Data from two children were omitted due to the lack of comprehension of the scale items based on supporting teacher’s advice at the time of data collection. Outliers were explored in the dataset resulting in the removal of two participants due to extreme values. At time one the C-CHB mean was 73.79 and 5% trimmed mean = 74.04. Similar results were apparent for other totals indicating that the mean score for the resulting dataset was not skewed by extreme values. However, normality assumptions were not met for current activity, volition, intention, knowledge and self-efficacy measures for both male and females as the Kolmogorov-Smirnov statistic was significant. As a result non-parametric statistical analysis was required and Spearman’s Rank Order correlations were run.

*5.4.1.6 Results*

Spearman’s rank order correlations can be seen in Table 9. No significant relationships were found between the C-CHB scale and any of the constructs measured at time one.

**Table 9.**

*Spearman's rank order correlations of validation measures with the C-CHB scale*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | CHB T1 | CDT | CA | K | I | V | A | PASE | DSE | BDS |
| CHBT1 | - |  |  |  |  |  |  |  |  |  |
| CDT | -.027 | - |  |  |  |  |  |  |  |  |
| CA | .048 | **.334\*\*** | - |  |  |  |  |  |  |  |
| K | .109 | **.187\*** | .129 | - |  |  |  |  |  |  |
| I | -.105 | **.344\*\*** | **.303\*** | **.196\*** | - |  |  |  |  |  |
| V | -.076 | .146 | -.038 | -.024 | -.061 | - |  |  |  |  |
| A | .012 | .090 | .131 | -.093 | .050 | .102 | - |  |  |  |
| PASE | .003 | **.284\*** | **.217\*** | **.249\*** | **.577\*\*** | .061 | -.038 | - |  |  |
| DSE | -.025 | **.318\*\*** | **.405\*\*** | **.254\*** | **.569\*\*** | -.138 | -.039 | **.516\*\*** | - |  |
| BDS | .142 | -.038 | .093 | .131 | .154 | .022 | .154 | -.033 | .149 | - |

CHBT1= Compensatory health beliefs at time one; CDT=Current diet total; CA=Current Activity; K=knowledge; I=Intention; V=Volition; A=Anxiety; PASE=Physical Activity Self-efficacy; DSE= Dietary self-efficacy; BDS=Body dissatisfaction; \*\*=p<.001; \*p<.05

A number of significant relationships were apparent in relation to dietary behaviours with current activity, knowledge, intention and self-efficacy. Self-efficacy was also associated with activity, knowledge and intention. There were no significant correlations between the C-CHB scale and any of the validation measures.

*Test–retest Reliability*

The internal consistency values of the C-CHB scale were high at both time one (α = .899) and time two (α = .894).

The intraclass correlation coefficient (ICC) was also used as an estimate of reliability using a two factor mixed effects model. A high degree of reliability was found between time one and time two scores with a single ICC measurement of .837 with a 95% confidence interval rating from .758-.890. However, there appeared to be a significant difference between time one and time two administration F(1, 100) = 18.98, p<.001. This could be explained by the different conditions in which the C-CHB scale was completed where children may have experienced boredom and fatigue effects during time one when completing a number of additional questionnaires compared with only completing one scale at time two. In addition to design issues, a number of external factors in the children’s environment could potentially explain the significant difference between time 1 and time 2 scale administrations. As the scales were administered in a school setting it is possible that children were taught sessions in relation to diet and/or physical activity in between time 1 and time 2 administration. Whilst a three week test-retest time interval was selected to avoid changes to the latent variable, it is possible that children encountered diet and activity topics as they are included in the school curriculum. Teachers may have taught a session on these topics or the school may have invited an external guest to teach children about diet and/or physical activity which added to children’s original knowledge and beliefs on this topic, resulting in changes to the latent variable. If this was the case, it could explain the difference in scores at time 2 compared to time 1.

C-CHB total scores at time one (N=117) were correlated with retest scores collected three weeks later (N=126). A test-retest correlation of *r*=.727 (p<.0001, *N* = 103) was obtained which indicates high stability over the retest period. However, due to the significant difference between time one and time two administrations as indicated by the ICC, this result should be treated with caution.

**5.5 Discussion**

This chapter outlined the development of a reliable tool which can measure compensatory reasoning in children aged between 7-11 years. The scale development process utilised qualitative and quantitative methods of item generation and enlisted the critical support of experts in the field, namely children, parents, health psychologists, teachers and academics in education to ensure the scale items were a good measure of compensatory reasoning. This resulted in the development of a 39 item scale that was tested in a large sample of children.

The scale’s dimensionality test revealed 29 items across three factors, that each contributed to an overall measure of compensatory reasoning. These factors related to diet, activities, and routine. The internal consistency of the overall scale was high and two sub-scales demonstrated high internal consistency (routine and diet) but the activity sub-scale internal consistency remained low. This could be due to the fact that children were asked to score items that relate to vague, abstract terms that they are unfamiliar with such as ‘screen time’ which was beyond their cognitive reasoning capabilities. Although concrete examples of screen time were explained during the introduction, the language used to describe activities may have been too abstract, ambiguous or broad for the scale item itself. The items have been retained within the scale due to the exploratory nature of this research but items may need to be reworded to have more meaning and the scale should then be tested again.

The current C-CHB scale offers a reliable measure of general compensatory reasoning and is suitable for use with children aged between 7-11 years in a school setting. However, due to the significant difference between time one and time two administrations of the C-CHB scale, as indicated by the ICC, the scale’s high test-retest score will need to be treated with caution. The C-CHB scale will need to have its temporal stability measured in the same conditions in future to ensure it is a reliable measure over time.

Children’s CHBs also need to be tested in a number of different contexts against different constructs in order to understand this type of reasoning further. Unfortunately, the preliminary validation study in this chapter does not contribute additional understanding of children’s compensatory reasoning. Methodological issues include giving children too many questionnaires at time one, with an approximate one hour completion time, which could have resulted in boredom or fatigue effects. Children may have struggled to recall dietary and activity behaviours which further questions the utility of scales included. It could be that an extensive questionnaire design is unsuitable for children due to limits on their attention and memory in comparison to adults.

The C-CHB scale therefore needs to be subject to a more robust validation study. Validation is an on-going process when developing a new scale (Streiner & Norman, 1995). Future validation studies are necessary and may need to include use of a different range of outcome measures including objective measures such as accelerometers to measure children’s levels of activity. The use of fewer questionnaires would limit confounding variables such as boredom or fatigue effects thus improving the design of a study. Due to children’s limited attention and developing cognitions, it might be more appropriate to prime children in relation to the constructs being measured using a range of techniques such as drawing pictures, picture sorting, role playing and discussions to ensure the intended construct is being measured and to avoid the validation scale items tapping into different beliefs that children may hold. Future research will also need to obtain a sufficiently large sample in order to test the C-CHB’s underlying structure using a confirmatory factor analysis (CFA). This was beyond the scope of this study as the sample size of the validation study was too small to conduct a CFA.

Future research is required to understand CHBs at a theoretical level. Nonetheless, the current 29-item scale is a reliable measure that has been tested and is suitable for use in a school setting for children aged 7-11 years. The C-CHB scale can be used in future validation studies to test compensatory reasoning and its convergent and divergent validity with other psychological measures. It would be useful for future research to assess the scale’s suitability in a clinical setting. The C-CHB scale may then be used to measure beliefs of overweight and obese children who struggle to regulate their weight, to understand if CHBs are a barrier to weight loss. The scale can also be used as a pre- and post- measurement tool for interventions promoting a healthy lifestyle.

**CHAPTER 6**

**Discussion**

The aims of this programme of research were to: establish children’s health beliefs in relation to the determinants of obesity at the cognitive level; assess children’s cognitive capacity to engage in compensatory reasoning; explore children’s health beliefs in relation to CHBs for behaviour associated with a healthy lifestyle; develop a scale with the ability to capture a reliable measure of the strength of compensatory reasoning.

**6.1 What was already known on the topic?**

Rates of overweight and obesity in child and adult populations are high (Health and Social Care Information Centre, 2014). The costs associated with obesity include costs at an individual level in terms of increased risk of physical illnesses such as type-2 diabetes, certain cancers, joint problems and emotional problems such as poor self-esteem and depression (Flint, Smith & Caborn, 2004), and economic costs which include costs to the National Health Service and wider economy in terms of sickness and absence from work (Foresight, 2007; House of Commons Health Committee, 2004; National Obesity Forum, 2014).

The multi-faceted, complex nature of the causal factors of obesity is recognised and outlined in the Foresight report (2007) which identified an interaction between biological, behavioural (including activity and diet), social and psychological factors. A biological predisposition to consume and conserve food in an environment where energy-dense food is inexpensive and available in abundance, with little practical need to be physically active, has exposed the need to engage in conscious thought processes to override this metabolic sensitivity in order to regulate weight maintenance and support weight reduction (Foresight).

Individual psychology was identified as a determinant of obesity (Foresight, 2007) and could be understood in terms of experiencing psychological ambivalence. This involves the experience of cognitive dissonance, or mental conflict which arises when two conflicting mental states occur (Festinger, 1957). Psychological ambivalence is identified as a common experience in a modern society with the availability of tempting but unhealthy food that conflicts with health goals such as the desire to be healthy and/or slim (Foresight, 2007). The psychological processes underpinning this ambivalence have been explained in one model by Knauper, Rabiau, Cohen and Patriciu (2004) who developed the compensatory health belief (CHB) model. According to the CHB model, when faced with temptations and desires that compromise long-term health goals, such as the desire to eat cake when holding a health goal of losing weight, cognitive dissonance or motivational conflict occurs. This conflict can be alleviated by either resisting the temptation, adapting outcome expectancies or risk perception so that an individual no longer perceives themselves to be at risk, or by activating a CHB which is the belief that the negative effects of an unhealthy behaviour can be compensated for by carrying out another healthy behaviour, e.g. it is ok to eat cake if one goes to the gym later that day. CHBs have been associated with poorer health outcomes as compensatory intentions are predictive of increased caloric intake in dieters (Kronick, Auerbach, Stich & Knauper, 2011) and coronary heart disease patients (Taut & Baban, 2008). CHBs are associated with poorer blood glucose control and adherence to self-care behaviours in adolescents with diabetes (Rabiau, Knauper, Nguyen, Sufrategui & Polychronakos, 2009) and lower intentions to quit smoking and engage in physical activities in adolescents (Radtke, Scholz, Keller, Knauper & Hornung, 2010; Berli, Loretini, Radtke, Hornung & Scholz, 2014).

CHBs have been demonstrated across a range of health behaviours in an adult and adolescent population but no published research to date has explored CHBs in children. The most effective measure to prevent obesity is to target children as healthy behaviours established in childhood are likely to remain in adulthood (Brown & Summerbell, 2009). A number of health campaigns have been implemented to promote physical activity and a diet high in fruit and vegetables and low in sugar and fat (Department of Health, 2005, Department of Health, 2011). Despite these efforts, children still do not eat enough fruit and vegetables and do not engage in sufficient levels of physical activity. This suggests there may be other underlying factors involved in children’s decision making processes. It appears children, assuming they have the correct knowledge that physical activity and fruit and vegetable consumption is important, may fail to resist the temptation of indulging in unhealthy activities. If children hold CHBs in relation to behavioural determinants of obesity, these beliefs needs to be understood further in order to develop age-appropriate health interventions targeting CHBs which could promote a healthier lifestyle by either challenging this type of reasoning in children or by encouraging adaptive compensatory reasoning which involves identifying CHBs that can effectively neutralise the negative consequences of unhealthy behaviour. Prior to the development of health interventions, children’s causal reasoning of the risks associated with specific behaviours implicated in the onset of obesity need to be understood. In order to engage in compensatory reasoning, children need to be able to generate multiple causal links and equate those in order to identify suitable compensatory behaviours. Children’s cognitive capacity to engage in compensatory reasoning needs to be explored in the first instance as this type of reasoning requires flexibility and reversibility in thought. Only once this has been established can future research explore the range of domains in which children might utilise such reasoning and employ compensatory health beliefs.

**6.2 What this programme of research has contributed to the field**

This programme of research sought to make a novel contribution to the field of health psychology. Theoretical contributions include: understanding children’s beliefs in relation to the determinants of overweight and obesity at the cognitive level; and identifying children have the cognitive capacity to engage in compensatory reasoning and hold CHBs in relation to a number of lifestyle behaviours implicated in the onset of overweight and obesity. Methodological contributions include: use of a novel draw and talk methodology to explore children’s health beliefs; and development of a scale which measures the strength of children’s compensatory reasoning in relation to activity, diet and health protective behaviours within children’s daily routine including brushing teeth, meal times and sleep. Each of these will be summarised briefly in terms of the implications they have for children’s health and obesity prevention.

*6.2.1 Theoretical Contributions*

The draw and talk study explored children’s health beliefs in relation to the determinants of overweight and obesity at the cognitive level. This study revealed children hold beliefs in terms of the definition, prevention and cause of overweight and obesity based on a number of behavioural and control beliefs, and confirmed that children have the cognitive capacity to engage in compensatory reasoning.

Explanations to define overweight and obesity were based on biological factors relating to body shape and size with almost all children associating obesity with an endomorphic body shape. This is indicative of successfully priming children to think about being unfit and unhealthy in terms of an increased body size but this also supports previous research findings that children identify a large stomach as a prominent feature of obesity (Babooram, Mullan & Sharpe, 2011). Behavioural beliefs in terms of low levels of physical activity and an unhealthy diet comprising low levels of fruit and vegetables and a diet high in sugar and fat were inferred when defining an overweight and obese individual. Thus children identify lack of engaging in health-protective behaviours and excessive engagement with health-risk behaviours that are within an individual’s control as defining features of a large body size. Negative moral judgements of laziness, greediness and not trying hard enough were also apparent. This indicates children attribute the onset of a large body size to a controllable cause, based on activity and diet, thus demonstrating from an early age the early onset of control beliefs which can inform the development of negative stereotypes (Anesbury & Tiggeman, 2000). Children also inferred negative emotional states associated with a large body size which is indicative of an awareness of an anti-fat bias in the environment (Schwartz & Brownell, 2004). This awareness of an anti-fat bias in the environment could be reinforced by externally imposed behavioural guidelines which encourage children to eat healthy food and engage in physical activity (Department of Health, 2011). This awareness of the need to engage in health protective behaviour that is within their control could create an internal conflict when faced with tempting but unhealthy choices such as eating sweets or engaging in prolonged sedentary activities. The obesogenic environment may present many opportunities for this conflict to occur, exacerbated by the fact that people encounter on average up to 200 food and eating decisions per day (Wansink & Sobal, 2007). This indicates children may encounter opportunities within their environment which require effective self-regulatory strategies to minimise the potential conflict experienced. The use of self-regulatory strategies used by children was explored in the second study in this programme of research which looked specifically at compensatory reasoning in children, a strategy which has been identified to resolve this conflict.

The prevention of overweight and obesity was discussed in terms of engaging in behavioural factors such fruit and vegetable consumption and increased levels of physical activity and psychological factors of ‘trying hard enough’, with children as young as five years demonstrating an awareness that they can engage in health protective behaviour to maintain health. Causal explanations of children’s beliefs varied ranging from simplistic to more wide-ranging and detailed explanations with many children offering explanations within Bibace and Walsh’s (1979) developmentally ordered framework, which assumes children’s conceptions of health and illness progress through a sequence of stages based on age. However, children also offered explanations for the causal factors of overweight and obesity that were beyond Bibace and Walsh’s prescribed framework, particularly in relation to diet. This questions the utility of developmental frameworks and instead lends support towards adopting a domain-specific approach of understanding children’s cognitive-development (Croker, 2012) and acknowledges the role of experience in children’s developing cognitions (Myant & Williams, 2005).

Understanding children’s knowledge in relation to overweight and obesity based on its definition, prevention and causal factors could support the development of future health campaigns by incorporating developmentally appropriate messages (Piko & Bak, 2006). According to this study, health information for dietary behaviour could be pitched at a higher level than for other behaviour such as physical activity and suggests language should be concrete as high-level abstract reasoning in relation to overweight and obesity was not apparent in this study.

The draw and talk study also confirmed that children have the cognitive capacity to engage in compensatory reasoning. This was previously unknown in the cognitive-developmental and health psychology literature and offers a novel contribution to the academic discipline. Physical activity and fruit and vegetable consumption were identified as key compensatory behaviours which were capable of eliminating the negative effects of unhealthy behaviours identified in the onset of weight gain. Most children were unable to offer psychological explanations of compensatory reasoning but using concrete behaviour, they offered explanations of compensatory reasoning at the cognitive level.

Study one involved a relatively abstract third-person task which asked children about causal factors in relation to figure silhouettes. The second study in this programme of research aimed to explore children’s health beliefs in relation to CHBs from a first-person perspective for behaviours implicated in the onset of overweight and obesity and to consider the influences on children’s CHBs. The analysis identified three themes *‘General Health Beliefs’*, *‘Compensatory Health Beliefs’* and *‘Influential Factors on CHBs’*.

The first theme in relation to general health beliefs demonstrates the complexity of children’s understanding of health concepts. Children hold both accurate and inaccurate beliefs in relation to guidelines promoting daily physical activity and fruit and vegetable consumption (Department of Health, 2005; Chief Medical Officer, 2011). It is important to continue promoting accurate health beliefs as children will develop intentions to perform behaviour based on a positive and negative evaluation of the outcome of behavioural beliefs (Ajzen, 1991). If children develop attitudes based on incorrect beliefs, this could have negative implications for health behaviour as attitudes developed in childhood are likely to continue into adulthood (Piko & Bak, 2006).

The second theme evidenced children hold a range of CHBs in relation to activity, diet and routine. CHBs were based on accurate and inaccurate health beliefs and follow a similar order and sequence of behaviour that is demonstrated in adult compensatory reasoning, that is, a healthy behaviour can be used to restore balance or compensate for an unhealthy behaviour (Knauper, Rabiau, Cohen & Patriciu, 2004). The data evidenced three key compensatory behaviours: fruit and vegetable consumption, physical activity and brushing teeth. Children also identified compensatory behaviours in relation to sleep, fresh air, drinking water, using mouthwash and modifying the amount of food consumed to compensate for activity levels, diet and routine.

A number of factors influence children’s construction of a CHB including: reasoning strategies based on food categorisation (Oakes, 2005) which identify food with functional properties that are capable of eliminating fat; developing complexities of CHBs with age and experience (Bandura, 1991) as children identify a wider range of CHBs for dietary behaviour and offer more detailed explanations for these compared with CHBs in other health domains which they have less experience of self-regulating such as sleeping patterns; self-regulatory processes influence the construction of CHBs and these processes can inform children’s self-efficacy beliefs which are informed by children’s ability to reflect on their experience with the environment. Thus children’s personal experiences inform positive and negative outcome expectancies of healthy and unhealthy behaviour. These experiences could inform the construction of a CHB based on either a negative experience which increases their perception of risk (Weinstein, 1980) which results in anticipatory conflict and results in the activation of a CHB; or positive experiences of using CHBs which could increase the likelihood of activating CHBs as this will inform children’s self-efficacy beliefs (Bandura, 1991) that they can effectively compensate for the negative consequences of an unhealthy behaviour.

External influences on children’s construction of a CHB include family influences based on exposure to role modelling behaviour and parental strategies. Children are exposed to parental strategies including negotiating desirable and undesirable behaviours to motivate children to engage in an undesirable behaviour, e.g. earn sweets as a resulting of completing chores. Children may learn to negotiate healthy and unhealthy choices based on these early experiences in life (Bandura, 1991). The social environment also informs children’s beliefs as peer influences, school and media inform children’s behaviour and attitude towards activity levels and diet. Children in this study discuss the desire to eat a high-sugar diet and also identify health goals. Children may experience conflict as a result of an interaction between internal and external influences on behaviours which they are unable to fully self-regulate. Thus conflict could be internal, based on an innate desire to consume sweet food (Dovey, 2010) but also as a result of restrictive parental control strategies (Birch, 1999) limiting access to unhealthy but desirable choices. It is possible that children use CHBs to alleviate both types of conflict.

Both of the qualitative studies in this programme of research yielded a rich dataset. Although two different qualitative methods were used including one-to-one interviews and focus group discussions, similar reasoning was apparent in children in relation to behavioural beliefs and compensatory reasoning. Children in both studies identify fruit and vegetables and physical activity as key compensatory behaviours which have fat-eliminating properties. Children’s beliefs indicate an understanding that they can control behaviour by minimising sugar consumption and engaging in physical activities. Children mention the desire to eat unhealthy food and also demonstrate an awareness of the stigma associated with a large body size caused by sugary snacks and inactivity, and when presented with these choices in their environment, they may experience conflict between the desire to consume unhealthy snacks but to avoid a visible outcome of weight gain, which is associated with negative attributes such as being lazy and not trying hard enough. Children might use CHBs to alleviate such conflicts. Further research is required to explore the nature of conflict children experience when activating CHBs in order to understand this type of reasoning further and the implications this has for engaging in healthy lifestyle behaviours.

Previous research has found CHBs did not predict physical activity behaviour but appeared to lower intentions to be physically active (Berli, Loretini, Radtke, Hornung & Scholz, 2014) and CHBs are negatively related to the intention to quit smoking over and above risk perception, positive outcome expectancies, self-efficacy and intention (Radke, Scholz, Keller, Knauper & Hornung, 2010). It is unclear whether CHBs are associated with poorer health outcomes in children. The process of children’s compensatory reasoning in relation to a healthy lifestyle will need to be explored further as the tendency to engage in compensatory reasoning could be linked with lower intentions to engage in health protective behaviour. The adult literature suggests CHBs do not always lead to compensatory behaviour or indeed that compensatory behaviour is informed by activating a CHB. Kaklamanou, Armitage and Jones (2012) suggest that once activated, there are three ways that CHBs could be used: a) to state a belief in a CHB but do not engage in compensatory behaviours; b) state a belief in a CHB and engage in compensatory behaviours; and c) state no belief in a CHB but engage in compensatory behaviours. Further research is required to explore the belief-behaviour process of CHBs in adults but as this programme of research confirms compensatory reasoning is apparent in children, future research will also need to examine the belief-behaviour process of CHBs in children.

*6.2.2 Methodological Contributions*

Methodological contributions include use of a novel draw and talk methodology to explore children’s health beliefs at the cognitive level. Previous research included the use of the ‘draw-and-write’ (Williams, Wetton & Moon, 1989) and ‘draw-write-and-talk’ method (Backett & Alexander, 1991) to understand health education research topics with children such as skin cancer (Pion et al., 1997) and views on hospital care (Horstman, Aldiss, Richardson & Gibson, 2008). Limitations of the ‘writing’ component of the draw and write method was that children often know more than they can write which led to the inclusion of the ‘talk’ component of the draw-write-and-talk method, and this enabled a deeper insight into children’s thinking (Backett & Alexander, 1991). However, the ‘writing’ component of this method does not add any additional understanding of children’s beliefs which the ‘talk’ component cannot achieve, with the ‘talk’ element of this method achieving a deeper insight into children’s beliefs than ‘writing’ can achieve. Writing is a redundant activity as it does not offer additional insight into children’s thinking and is an activity which requires more effort from participating children with no additional insights obtained.

Thus the draw-and-talk method offers a novel method of understanding children’s health beliefs. The draw and talk method involves inviting children to draw pictures, which are designed to act as a visual prompt and ice-breaker, accompanied by an opportunity to talk about their beliefs using Piaget’s (1930) method of clinical interviewing in a one-to-one setting. Piaget’s method of clinical interviewing involves the use of prompts such as “tell me more”, “how does…” and can elicit children’s reasoning at the underlying cognitive level until no further explanation is available i.e. children’s responses are cognitively exhausted. No previous research in the field of health psychology has been identified as using this method, thus the ‘draw and talk’ method is considered a novel methodological contribution to the field.

Another methodological contribution results from development of the Child –Compensatory Health Belief scale (C-CHB scale). The C-CHB scale is a 29-item scale which can measure compensatory reasoning in children aged between 7-11 years. The scale development process utilised qualitative and quantitative methods of item generation which resulted in an initial 36-item scale that was tested in a large sample of children. Psychometric testing of the scale resulted in a 29-item scale with three sub-scales: diet, activity and routine. The internal consistency of the overall scale was high and the routine and diet sub-scales also demonstrated high internal consistency. The activity sub-scale internal consistency remained low and this could be due to the fact that scale items included vague abstract terms such as ‘screen time’. The items have been retained due to the exploratory nature of research but items may need to be reworded to have more meaning and the scale should be tested again. Validation is an on-going process when developing a new scale (Streiner & Norman, 1995). Future validation studies will need to test the C-CHB scale’s construct validity and will also need to obtain a sufficiently large sample in order to test the C-CHB scale’s underlying structure using a confirmatory factor analysis (CFA).

**6.3 Limitations**

As this programme of research involved conducting research with children, a number of challenges were apparent which were largely based around the need to use methods of data collection that were correctly tapping into children’s underlying beliefs. Children’s cognitive-development and language development were key considerations throughout the research process. Each study was designed with these considerations in mind to ensure that the data obtained was a true reflection of children’s thinking.

It was challenging to research a psychological construct, compensatory reasoning, in a population that had no previously published research. It was very important to ensure the data was an accurate reflection of this particular type of thinking and to ensure children had the opportunity to demonstrate whether or not compensatory reasoning was a cognitive strategy they employed in relation to a healthy lifestyle. With these concerns and considerations in mind, the draw-and-talk method of data collection was established to identify whether or not children had the cognitive capacity to engage in this type of reasoning.

The draw and talk method could have included more concrete visual aids to support data collection instead of using the term ‘unhealthy’ and ‘unfit’ when discussing obesity. The study design could have included use of concrete items such as puppets, dolls, pictures or animations to encourage children to think about abstract concepts such as overweight and obese and to use these items as prompts during one-to-one interviews instead of using terms such as ‘unfit’ and ‘unhealthy’. This may have aided children’s understanding of the activity in relation to the definition, prevention, cause and compensatory reasoning of obesity as it would have been less abstract and possibly easier for them to understand. However, the current draw and talk study yielded a rich, large and detailed dataset from a large number of children across two different schools. The breadth and depth of this data instilled confidence that children were given the opportunity to demonstrate whether or not they had the cognitive capacity to engage in compensatory reasoning.

The second study in this programme of research utilised a focus group schedule to guide the focus group discussions. The focus group schedule covered a wide range of health domains based on factors identified from previous research which had been implicated in the onset of overweight and obesity. Although the focus group study was exploratory, on reflection, the focus group schedule may have included too many health domains as not all topics on the focus group schedule were discussed by each group due to time constraints. It may have been more appropriate to cover fewer topics in more detail than to cover lots of topics in less depth.

Similar issues may have been apparent during the scale development process, which again due to the exploratory phase of this programme of research may have attempted to cover too many health domains. This became increasingly apparent as adult research on CHBs was beginning to get published and only focused on one particular health domain at a time e.g. diet-specific or smoking-specific CHBs. However, this programme of research began when there were only two published papers on CHBs (Knauper, Rabiau, Cohen & Patriciu, 2004; Rabiau, Knauper & Miquelon, 2006), therefore previous literature on lifestyle behaviours implicated in the onset of obesity were initially used to guide the exploration of potential health domains in which children may hold CHBs. On reflection, health-domain specific scales e.g. a diet child-CHB scale or physical activity child-CHB scale could have been developed instead of a scale which attempts to measure general compensatory reasoning in relation to a healthy lifestyle, particularly as CHBs are defined as specific, in the moment justifications that vary. However, this current programme of research has identified a starting point for capturing a measure of compensatory reasoning in children which future research can continue to refine and modify accordingly.

Additional measurement issues were also apparent during the C-CHB scale validation study. The validation study included too many measures of convergent and divergent validity and did not include robust measures of behaviour as all measures were based on children’s self-report which may not be reliable due to memory constraints. Fatigue and boredom effects resulting from completion of too many questionnaires and the possibility that children were exposed to information between time one and time two administration of the C-CHB scale that altered their beliefs means the results of the validation study need to be treated with caution. Future validation studies of the C-CHB scale should not aim to measure too many psychological constructs and should treat construct validity as an on-going process. Fewer questionnaires should be included in a validation study with children to avoid boredom and fatigue effects.

The original proposal for this programme of research included only one qualitative research study to explore CHBs in children which would aid conceptual understanding of compensatory reasoning in children and also inform an item-generation pool to develop a scale measuring CHBs in children. The scale development studies were then intended to result in a measurement tool that would be used to obtain a pre- and post- score of compensatory reasoning that could be used in an intervention study which was included in the original proposal for this programme of research. However, upon completion of the first qualitative study, it became apparent that further research was required to understand CHBs at a conceptual level. The qualitative data, particularly focus group data, indicated the multitude of influences on the development of children’s CHBs and a tentative psychological model depicting this relationship has been developed as a result, but prior to developing an intervention which is designed to modify or discourage use of CHBs, further research is required to understand compensatory reasoning at a conceptual level. The scale development process occurred alongside qualitative data analyses and so the need to continue exploring conceptual issues in relation to children’s compensatory reasoning was not immediately apparent. If this had become apparent at an earlier stage of the research process, the scale development process may have differed to include development of more behaviour-specific CHB scales and a different choice of validation measures which would include objective measures such as accelerometers and the use of fewer questionnaires. Nonetheless, the resulting qualitative and quantitative data and analysis from each of the studies included within this programme of research offer a springboard for future research to continue exploring and understanding conceptual issues in relation to compensatory reasoning in children and also to refine and resolve measurement issues identified during this initial, exploratory scale development phase.

**6.4 Concluding comments**

The Foresight report (2007) and Cullen (2011) identified the need to explore psychological factors in relation to obesity. This programme of research sought to understand children’s health beliefs in relation to the determinants of obesity at the cognitive level and to assess compensatory reasoning in children. This programme of research achieved its aims. The theoretical contribution of this programme of research will support the development of future health and education campaigns. Exploring children’s health beliefs at the cognitive level has revealed children have a more advanced understanding of diet than they have for other factors such as biology, physical activity and psychological factors. This programme of research also identified children from as young as five demonstrate compensatory reasoning in relation to a range of behaviours implicated in the onset of overweight and obesity but was a more stable reasoning strategy apparent in children from aged 7 years onwards. Future research will need to expand on this understanding to explore compensatory reasoning in children further and to identify how compensatory reasoning is implicated in the decision-making process, i.e. is it associated with lower intentions to be healthy, or is it an adaptive reasoning strategy in children that should be encouraged? Methodological contributions include use of a qualitative draw and talk method and quantitative Child-CHB scale. These methodological contributions, in addition to established methods, can support future research to expand on the theoretical contributions of this programme of research to explore compensatory reasoning in children further.

**References**

Alderson, P. (2004). Ethics. In S. Fraser, V. Lewis, S. Ding, M. Kellett & C. Robinson, *Doing Research with Children and Young People* (pp. 97-112). London: Sage.

Anesbury, T., & Tiggemann, M. (2000). An attempt to reduce negative stereotyping of obesity in children by changing controllability beliefs. *Health Education Research, 15,* 145–152.

Anderson, A.S., & Shepherd, R. (1989). Beliefs and attitudes towards ‘healthier eating’ among women attending maternity hospital. *Journal of Nutrition Education, 17,* 208-213.

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behavior and Human Decision Processes, 50,* 179-211.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Aliaga, M., & Gunderson, B. (2000). *Interactive Statistics.* NJ: Saddle River.

Avan, B. I., & Kirkwood, B. R. (2010). Review of the theoretical frameworks for the study of child development within public health and epidemiology. *Journal of epidemiology and community health*, *64*(5), 388-393.

Babooram, M., Mullan, B.A., & Sharpe, L. (2011). Children's perceptions of obesity as explained by the common sense model of illness representation. *British Food Journal, 112 (3),* 234-247. doi 10.1108/00070701111105321

Backett, K., & Alexander, H. (1991). Talking to young children about health: methods and findings. *Health Education Journal, 50*(1)*,* 34-38.

Backett-Milburn, K., & McKie, L. (1999). A critical appraisal of the draw and write technique*. Health Education Research, 14*(3)*,* 387-398.

Bandalos, B. (1996). Confirmatory factor analysis. In J. Stevens (Ed.), *Applied multivariate statistics for the social sciences* (3rd ed., pp. 389-420). New Jersey: Lawrence Erlbaum.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2)*,* 191-215.

Bandura A. 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes, 50,* 248-287.

Bandura, A. (1994). *Self‐efficacy*. John Wiley & Sons, Inc.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: W.H. Freeman.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior*, *31*(2), 143-164.

Bell, A. (2007). Designing and testing questionnaires for children. *Journal of Research in Nursing, 12*(5*),* 461-469. doi: 10.1177/1744987107079616

Berli, C., Loretini, P., Radtke, T., Hornung, R., & Scholz, U. (2014). Predicting physical activity in adolescents: The role of compensatory health beliefs within the Health Action Process Approach. *Psychology & Health, 29*(4)*,* 458-474. <http://dx.doi.org/10.1080/08870446.2013.865028>

Bhaskar, R. (1989). *Reclaiming Reality: A Critical Introduction to Contemporary Philosophy*, London: Verso.

Bibace, R., & Walsh, M. E. (1979). Developmental stages in children's conceptions of illness. In G. Stone, R. Cohen, & N. Adler (Eds.), *Health psychology: A handbook* (pp. 285-301). San Francisco: Jossey-Bass.

Bibace, R., & Walsh, M.E. (1980). Development of children’s concepts of illness. *Pediatrics, 66*(6)*,* 912-917.

Birch, L. L. (1999). Development of food preferences. *Annual review of nutrition*, *19*(1), 41-62.

Bodrova, E., Leong, D.J., & Akhutina, T.V. (2011). When everything new is well-forgotten old: Vygotsky/Luria insights in the development of executive functions. In R.M. Lerner, J.V. Lerner, E.P. Bowers, S. Lewin‐Bizan, S. Gestsdottir & J.B. Urban (Eds,), *Thriving in childhood and adolescence: The role of self-regulation processes* (pp. 11-28). San Francisco: Wiley.

Borgers, N., & Hox, J.J. (2000) Reliability of responses in questionnaire research with children plus coding scheme: a technical report. *Paper delivered to the 5th International Conference on Logic and Methodology, 3–6 October,* Cologne, Germany.

Borgers, N., Hox, J., & Sikkel, D. (2003) Response quality in survey research with children and adolescents: the effect of labelled response options and vague quantifiers. *International of Public Opinion Research, 15*(1)*,* 83–94.

Bouchard, T. J. (1976). Field research methods: Interviewing, questionnaires, participant observation, systematic observation, unobtrusive measures. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology* (pp. 363– 413).Chicago: Rand McNally.

Bowling, A. (2009). *Research methods in health: Investigating health and health services* (3rd ed.). Berkshire: Open University Press.

Bradding, A., & Horstman, M. (1999). Using the write and draw technique with children. *European Journal of Oncology Nursing, 3* (3)*,* 170-175.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3,* 77-101.

British Psychological Society. (2009). *Code of Ethics and Conduct.* Leicester: The British Psychological Society.

Bronson, M.B. (2000). *Self-regulation in early childhood: Nature and nurture.* New York: The Guildford Press.

Brouse, C. H., & Chow, T. H. (2009). Exploring pre-operational and concrete operational children’s thinking on nutrition: A case study. *Health Education Journal*, *68*(3), 219-231.

Brown, T., & Summerbell, C. (2009). Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obesity Reviews, 10*(1)*,* 110-141.

Bryant, P. (1974). *Perception and understanding in young children.* London: Methuen.

Brylinsky, J.A., & Moore, J.C. (1994). The identification of body build stereotypes in young children. *Journal of Research in Personality,* 23, 123-130.

Bryman, A. (1992). Quantitative and qualitative research: further reflections on their integration. In J. Brannen (Ed), *Mixing methods: qualitative and quantitative research* (pp. 57-78) Ashgate: Aldershot.

Burbach, D. J., & Peterson, L. (1986). Children's concepts of physical illness: a review and critique of the cognitive-developmental literature. *Health Psychology*, *5*(3)*,* 307.

Carter, B., & Simons, J. (2014). *Stories of Children’s Pain: Linking Evidence to Practice.* London: Sage.

Carver, C. S., & Scheier, M. F. (2004). Self-regulation of action and affect. *Handbook of self-regulation: Research, theory, and applications*, 13-39.

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public health reports, 100(2),* 126.

Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate behavioral research, 1*(2)*,* 245-276.

Cervellon, M. C., & Dubé, L. (2005). Cultural influences in the origins of food likings and dislikes. *Food quality and preference*, *16*(5), 455-460.

Chaput, J. P., Brunet, M., & Tremblay, A. (2006). Relationship between short sleeping hours and childhood overweight/obesity: results from the ‘Quebec en Forme’Project. *International journal of obesity*, *30*(7), 1080-1085.

Chaput, J. P., & Tremblay, A. (2007). Does short sleep duration favor abdominal adiposity in children?. *International Journal of Pediatric Obesity*, *2*(3), 188-191.

Charman, T., & Chandiramani, S. (1995). Children's understanding of physical illnesses and psychological states. *Psychology and Health*, *10*(2), 145-153.

Chief Medical Officer. (2011). *UK Physical Activity Guidelines.* Retrieved from [*https://www.gov.uk/government/publications/uk-physical-activity-guidelines*](https://www.gov.uk/government/publications/uk-physical-activity-guidelines)

Childress, A. C., Brewerton, T. D., Hodges, E. L., & Jarrell, M. P. (1993). The Kids' Eating Disorders Survey (KEDS): a study of middle school students. *Journal of the American Academy of Child & Adolescent Psychiatry*, *32*(4), 843-850.

Coaley, K. (2009). *An Introduction to Psychological Assessments and Psychometrics.* London: Sage.

Comrey, A.L., & Lee, H.B. (1992). *A First Course in Factor Analysis* (2nd ed.). New Jersey: Lawrence Erlbaum Associates.

Conner, M., & Armitage, C.J. (2002). *The Social Psychology of Food.* Berkshire: Open University Press.

Conner, M., Povey, R., Sparks, P., James, R., & Shepherd, R. (2003). Moderating role of attitudinal ambivalence within the theory of planned behaviour. *British Journal of Social Psychology, 42* (1)*,* 75-94. DOI: 10.1348/014466603763276135

Conner, M., Sandberg, T., McMillan, B., & Higgins, A. (2006). Role of anticipated regret, intentions and intention stability in adolescent smoking initiation. *British Journal of Health Psychology*, *11*(1), 85-101.

Costello, A.B., & Osborne, J.W. (2005). Best Practices in Exploratory Factor Analysis: Four Recommendations for Getting the Most From Your Analysis. *Practical Assessment, Research & Evaluation, 10*(7)*,* 1-10.

Cramer, P., & Steinwert, T. (1998). Thin is good, fat is bad: how early does it begin?. *Journal of Applied Developmental Psychology*, *19*(3), 429-451.

Crandall, C. S. (1994). Prejudice against fat people: ideology and self-interest. *Journal of Personality and Social Psychology*, *66*(5), 882.

Croker, S. (2012). *The development of cognition .* Cengage

Cullen, K. (2011). Obesity in Children. In Obesity in the UK: A psychological perspective. *Obesity Working Group 2011* (pp. 56-65). Leicester: The British Psychological Society.

Dancy, C. P., & Reidy, J. (2004). *Statistics without maths for psychology.* Harlow: Pearson Education Limited.

Davis, A., & Jones, L. (1996). Davis, A., & Jones, L. (1996). Environmental constraints on health: Listening to children's views. *Health Education Journal, 55,* 363-374.

Davison, K. K., Marshall, S. J., & Birch, L. L. (2006). Cross-sectional and longitudinal associations between TV viewing and girls’ body mass index, overweight status, and percentage of body fat. *The Journal of pediatrics*, *149*(1), 32-37.

Deci, E.L., & Ryan, R.M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behaviour. *Psychological Inquiry, 11* (4)*,* 227-268.

Dellert, J. C., & Johnson, P. (2014). Interventions with children and parents to improve physical activity and body mass index: a meta-analysis. *American Journal of Health Promotion, 28*(4), 259-267.

Department for Communities and Local Government. (2011). *English Indices of Deprivation 2010.* Retrieved from <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6222/1871538.pdf>

Department of Health. (2004). *Department of Health resource accounts 2002–2003.* London: The Stationery Office Limited.

Department of Health. (2005) *Food and Health Action Plan.* Retrieved from <http://www.dh.gov.uk/policyandguidance/healthandsocialcaretopics/healthyliving/foodandhealthactionplan>

Department of Health. (2011). *Healthy Lives, Healthy People: A Call to Action on Obesity.* Retrieved from <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/213720/dh_130487.pdf>

Department of Health. (2011b). *Change4Life Three Year Social Marketing Strategy.* Retrieved from <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/213719/dh_130488.pdf>

Department of Health. (2013). *Reducing Obesity and Improving Diet.* Retrieved from <https://www.gov.uk/government/policies/reducing-obesity-and-improving-diet>

De Ridder, D. T. D., De Vet, E., Stok, F. M., Adriaanse, M. A., & De Wit, J. B. F. (2013). Obesity, overconsumption and self-regulation failure: The unsung role of eating appropriateness standards. *Health Psychology Review, 7,* 146-165.

DeVellis, R.F. (2012). *Scale Development Theory and Applications* (3rd ed.)*.* California: Sage.

Dietz, W. H., & Gortmaker, S. L. (1985). Do we fatten our children at the television set? Obesity and television viewing in children and adolescents. *Pediatrics, 75*(5), 807-812.

Dovey, T. (2010). *Eating Behaviour.* Berkshire: Open University Press.

Draxten, M., Fulkerson, J. A., Friend, S., Flattum, C. F., & Schow, R. (2014). Parental role modeling of fruits and vegetables at meals and snacks is associated with children's adequate consumption. *Appetite*, *78*, 1-7.

Duckworth, A. L., Tsukayama, E., & Geier, A. B. (2010). Self-controlled children stay leaner in the transition to adolescence. *Appetite*, *54*(2), 304-308.

Dugan, S.A. (2008). Exercise for preventing childhood obesity. *Physical Medicine and Rehabilitation Clinics of North America,* 19 (2), 205-216.

Eisenmann, J.C., Bartee, R.T. & Wang, M.Q. (2002). Physical activity, TV viewing, and weight in U.S. youth: 1999 Youth Risk Behavior Survey. *Obesity Research, 10,* 379-385.

Eiser, C. (1989). Children's concepts of illness: Towards an alternative to the “Stage” approach. *Psychology and Health*, *3*(2), 93-101.

Epstein, L. H., Salvy, S. J., Carr, K. A., Dearing, K. K., & Bickel, W. K. (2010). Food reinforcement, delay discounting and obesity. *Physiology & Behavior*, *100*(5), 438-445.

Erjavec, M., Viktor, S., Horne, P., & Lowe, F. (2012). Implementing a healthy eating programme: changing children’s eating habits for life. *Community Practitioner, 85* (4)*,* 39-42.

Ernsting, A., Schwarzer, R., Lippke, S., & Schneider, M. (2012). “I Don’t Need a Flu Shot Because I Lead a Healthy Lifestyle”: Compensatory Health Beliefs Make Vaccination Less Likely. *Journal of Health Psychology, 0, 1-12 doi*:10.1177/1359105312455076

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological methods, 4 (3),* 272-299.

Farroqi, I.S. & O’Rahily, S. (2007). Genetic Factors in Human Obesity. *Obesity Reviews, 8,* 37-40.

Festinger, L. (1957). *A Theory of Cognitive Dissonance.* Stanford, CA: Stanford University Press.

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley. Retrieved from <http://people.umass.edu/aizen/f&a1975.html>

Fisher, J.O., Mitchell, D.C., Smiciklas-Wright, H., & Birch, L. L. (2002). Parental influences on young girls’ fruit and vegetable, micronutrient, and fat intakes. *Journal of the American dietetic association*, *102*(1), 58-64.

Flint, C., Smith, J. & Caborn, R. (2004). Choosing Health. *Obesity Bulletin, 1,* 1-8.

Foresight. (2007). *Tackling Obesity: Future Choices Project.* London: The Stationery Office Limited.

Foster, J., Barkus, E., & Yavorsky, C. (2006). *Understanding and using advanced statistics.* London: Sage.

Fraser, S. (2004). Situating Empirical Research. In S. Fraser, V. Lewis, S. Ding, M. Kellett & C. Robinson, *Doing Research with Children and Young People.* (pp. 15-26). London: Sage.

French, D. J., Christie, M. J., & Sowden, A. J. (1994). The reproducibility of the Childhood Asthma Questionnaires: measures of quality of life for children with asthma aged 4–16 years. *Quality of Life Research*, *3*(3), 215-224.

Friedman, M. A., & Brownell, K. D. (1995). Psychological correlates of obesity: moving to the next research generation. *Psychological bulletin*, *117*(1), 3.

Fuchs, M. (2005) Children and Adolescents as respondents. Experiments on question order, response order, scale effects and the effect of numeric values associated with response options. *Journal of Official Statistics, 21*(4)*,* 701–725.

Furr, R.M. (2011). *Scale Construction and Psychometrics for Social and Personality Psychology.* London: Sage.

Gabhainn, S. N., & Kelleher, C. (2002). The sensitivity of the draw and write technique. *Health Education, 102*(2)*,* 68-75.

Gavin, M.L. (2008). *The Many Benefits of Exercise*. Retrieved from <http://kidshealth.org.parent/nutrition.fit/fitness/exercise.html>

Golan, M. & Crow, S. (2004a). Parents Are Key Players in the Prevention and Treatment of Weight-related Problems. *Nutrition Reviews, 62*(1)*,* 39-50.

Golan, M., & Crow, S. (2004b). Targeting Parents Exclusively in the Treatment of Childhood Obesity: Long-Term Results. *Obesity Research, 12*(2)*,* 357-361.

Gollwitzer, P.M. (1999). Implementation intentions: strong effects of simple plans. *American Psychologist, 54,* 493-503.

Gollwitzer, P.M., & Sheeran, P. (2006). Implementation intentions and goal achievement: a meta-analysis of effects and processes. *Advances in Experimental Social Psychology, 38,* 69-119.

Gratton, L., Povey, R., & Clark‐Carter, D. (2007). Promoting children's fruit and vegetable consumption: interventions using the Theory of Planned Behaviour as a framework. *British Journal of Health Psychology, 12*(4), 639-650.

Greening, L., Stoppelbein, L., Chandler, C.C., & Elkin, T.D. (2005). Predictor’s of Children’s and Adolescent’s Risk Perception. *Journal of Pediatric Psychology, 30* (5)*,* 425-435.

Haerens, L., De Bourdeaudhuij, I., Maes, L., Vereecken, C., Brug, J., & Deforche, B. (2007). The effects of a middle-school healthy eating intervention on adolescents' fat and fruit intake and soft drinks consumption. *Public health nutrition*, *10*(05), 443-449.

Hagger, M.S., Chatzisarantis, N., Biddle, S.J.H., & Orbell, S. (2001). Antecedents of children’s physical activity intentions and behaviour: predictive validity and longitudinal effects. *Psychology and Health, 16,* 391-407. DOI:10.1080/08870440108405515

Harnack, L., Stang, J., & Story, M. (1999). Soft drink consumption among US children and adolescents: nutritional consequences. *Journal of the American Dietetic Association*, *99*(4), 436-441.

Harrison, J. A., Mullen, P. D., & Green, L. W. (1992). A meta-analysis of studies of the Health Belief Model with adults. *Health Education Research, 7*(1), 107-116.

Hayton, J. C., Allen, D. G., & Scarpello, V. (2004). Factor retention decisions in exploratory factor analysis: A tutorial on parallel analysis. *Organizational research methods, 7*(2)*,* 191-205.

Health and Social Care Information Centre. (2014). *Statistics on Obesity, Physical Activity and Diet England: 2014.* Retrieved from <http://www.hscic.gov.uk/catalogue/PUB13648/Obes-phys-acti-diet-eng-2014-rep.pdf>

Health and Social Care Information Centre. (2014b). *National Child Measurement Programme.* Retrieved from <http://www.hscic.gov.uk/ncmp>

Health Survey for England (2006). *CVD and risk factors adults, obesity and risk factors children.* Retrieved from <http://www.hscic.gov.uk/pubs/hse06cvdandriskfactors>

Heary, C.M., & Hennessy, E. (2002). The Use of Focus Group Interviews in Pediatric Health Care Research. *Journal of Pediatric Psychology, 27* (1)*,* 47-57.

Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published research common errors and some comment on improved practice. *Educational and Psychological measurement, 66* (3)*,* 393-416.

Hesketh, K., Waters, E., Green, J., Salmon, L., & Williams, J. (2005). Healthy eating, activity and obesity prevention: a qualitative study of parent and child perceptions in Australia. *Health promotion international*, *20*(1), 19-26.

Hill, J.O. (2006). A Family-Based Approach to Preventing Excessive Weight Gain. *Obesity, 14*(8), 1392-1401.

Hill, M., Laybourn, A., & Borland, M. (1996). Engaging with primary‐aged children about their emotions and well‐being: methodological considerations. *Children & Society, 10*(2)*,* 129-144. DOI: 10.1111/j.1099-0860.1996.tb00463.x

Hogan, M. J. (2012). Prosocial effects of media. *Pediatric Clinics of North America*, *59*(3), 635-645.

Horstman, M., Aldiss, S., Richardson, A., & Gibson, F. (2008). Methodological issues when using the draw and write technique with children aged 6 to 12 years. *Qualitative Health Research, 18*(7)*,* 1001-1011.

Houldcroft, L., Haycraft, E., & Farrow, C. (2014). Peer and friend influences on children's eating. *Social Development*, *23*(1), 19-40.

House of Commons Health Committee. (2004). *Obesity.* London: The Stationery Office Limited.

Hu, F. B. (2013). Resolved: there is sufficient scientific evidence that decreasing sugar‐sweetened beverage consumption will reduce the prevalence of obesity and obesity‐related diseases. *Obesity Reviews*, *14*(8), 606-619.

Huddy, D. C., Johnson, R. L., Stone, M. H., Proulx, C. M., & Pierce, K. A. (1997). Relationship between body image and percent body fat among male and female college students enrolled in an introductory 14-week weight-training course. *Perceptual and motor skills*, *85*(3), 1075-1078.

Jackson, D., Djafarian, K., Stewart, J., & Speakman, J.R. (2009). Increased television viewing is associated with elevated body fatness but not with lower total energy expenditure in children. *The American Journal of Clinical Nutrition, 89*(4)*,* 1031-1036. doi: 10.3945/ajcn.2008.26746

James, J., Thomas, P., Caven, D., & Kerr, D. (2004). Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomised controlled trial. *BMJ, 328,* 1-6. doi: <http://dx.doi.org/10.1136/bmj.38077.458438.EE>

Janz, N.K., & Becker, M.H. (1984). The Health Belief Model: A Decade Later. *Health Education & Behaviour, 11*(1)*,* 1-47.

Jimenez-Pavon, D., Kelly, J., & Reilly, J.J. (2010). Associations between objectively measured habitual physical activity and adiposity in children and adolescents: Systematic review. *International Journal of Pediatric Obesity, 5*(1)*,* 3-18. DOI: 10.3109/17477160903067601

Joffe, H., & Yardley, L. (2004). Content and thematic analysis. In D.F. Marks, & L. Yardley, *Research Methods for Clinical and Health Psychology* (pp 56-68). London: Sage.

Johnson, R.B., Onwuegbuzie, A.J., & Turner, L.A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research, 1*(2)*,* 112-133.

Jones, A. (2004). Involving Children and Young People as Researcher In S. Fraser, V. Lewis, S. Ding, M. Kellett & C. Robinson, *Doing Research with Children and Young People.* (pp. 113-130). London: Sage.

Kaiser, H.F. (1974). An index of factorial simplicity. *Psychometrika, 39,* 31-36.

Kaklamanou, D., Armitage, C.J., & Jones, C.R. (2013). A further look into compensatory health beliefs: A think aloud study. *British Journal of Health Psychology, 18,* 139-154.

Kalish, C. (1996). Causes and Symptoms in Preschoolers' Conceptions of Illness. *Child Development, 67*(4)*,* 1647-1670.

Kalnins, I., McQueen, D.V., Backett, K.C., Curtice, L., & Currie, C.E. (1992). Children, empowerment and health promotion: some new directions in research and practice. *Health Promotion International, 7*(1)*,* 53-59.

Kelder, S., Hoelscher, D. M., Barroso, C. S., Walker, J. L., Cribb, P., & Hu, S. (2005). The CATCH Kids Club: a pilot after-school study for improving elementary students’ nutrition and physical activity. *Public health nutrition*, *8*(02), 133-140.

King, N., & Horrocks, C. (2010). *Interviews in Qualitative Research.* London: Sage.

Klaczynski, P. A. (2008). There’s something about obesity: Culture, contagion, rationality, and children’s responses to drinks “created” by obese children. Journal of experimental child psychology, 99(1), 58-74.

Klesges, R.C., Klesges, L.M., Eck, L.H., & Shelton, M.L. (1995). A longitudinal analysis of accelerated weight gain in preschool children. *Pediatrics, 95*(1)*,* 126-30.

Kline, P. (1994). *An Easy Guide to Factor Analysis.* New York: Routledge.

Knauper, B., Rabiau, M., Cohen, O., & Patriciu, N. (2004). Compensatory Health Beliefs: Scale Development and Psychometric Properties. *Psychology and Health, 19*(5)*,* 607-624.

Krane, V., Stiles-Shipley, J., Waldron, J., & Michalenok, J. (2001). Relationships among body satisfaction, social physique anxiety, and eating behaviors in female athletes and exercisers. *Journal of Sport Behaviour*, *24*(3), 247-264.

Krause, N. (2002). A comprehensive strategy for developing close-ended survey items for use in studies of older adults. *Journal of Gerontology, 57*(5)*,* 263-274.

Krebs-Smith, S. M., Cook, D. A., Subar, A. F., Cleveland, L., Friday, J., & Kahle, L. L. (1996). Fruit and vegetable intakes of children and adolescents in the United States. *Archives of Pediatrics & Adolescent Medicine,* 150(1), 81–86.

Krippendorf, K. (1989). *Content Analysis: An introduction to its methodology.* London: Sage.

Kronick, I., Auerbach, R.P., Stich, C., & Knauper, B. (2011). Compensatory beliefs and intentions contribute to the prediction of calorie intake in dieters. *Appetite, 57,* 435-438.

Kronick, I., & Knauper, B. (2010). Temptations elicit compensatory intentions. *Appetite, 54,* 398-401.

Krueger, R.A. (1994). *Focus Groups: a Practical Guide for Applied Research.* California: Sage.

Kuhn, D. (2002). What is scientific reasoning and how does it develop? In U. Goswami (Ed.), *Handbookof childhood cognitive development* (pp. 371–393). Oxford, UK: Blackwell.

Lerner, R.M., Lerner, J.V., Bowers, E.P., Lewin-Bizan, S., Gestsdottir, S., & Urban, J.B. (2011). Self-Regulation Processes and Thriving in Adolescence: A View of the Issues. In R.M. Lerner, J.V. Lerner, E.P. Bowers, S. Lewin-Bizan, S. Gestsdottir & J.B. Urban (Eds), *Thriving in Childhood and Adolescence: The Role of Self-Regulation Processes* (pp. 1-10). San Francisco: Wiley.

Lerner, R.M., Lewin-Bizan, S., & Warren, A.E.A. (2011). Concepts and theories of human development. In M.H. Bornstein & M.E. Lamb (Eds.), *Developmental science an advanced textbook* (6th ed.) (pp.3-50). Hove: Psychology Press.

Leventhal, H., Meyer, D., & Nerenz, D. (1980). The common sense representation of illness danger. *Contributions to medical psychology*, *2*, 7-30.

Levine, I.S., & Zimmerman, J.D. (1996). Using qualitative data to inform public policy: Evaluating Choose to De-Fuse. *American Journal of Orthopsychiatry, 66* (3)*,* 363-377.

Lewis, V. (2004). Doing Research with Children and Young People: An Introduction. In S. Fraser, V. Lewis, S. Ding, M. Kellett & C. Robinson, *Doing Research with Children and Young People.* (pp. 1-11). London: Sage.

Lindsay, A.C., Sussner, K.M., Kim, J., & Gortmaker, S. (2006). The Role of Parents in Preventing Childhood Obesity. *The Future of Children, 16*(1)*,* 169-186.

Logan, G.D. (1994). On the ability to inhibit thought and action: A users’ guide to the stop signal paradigm. In D. Dagenbach, T.H. Carr, (Eds.), *Inhibitory processes in attention, memory, and language* (pp. 189-239). San Diego: Academic Press.

Ludwig, D.S., Peterson, K.E., & Gortmaker, S.L. (2001). Relation between Consumption of Sugar-Sweetened Drinks and Childhood Obesity: A Prospective, Observational Analysis*. Lancet, 357*(9255)*,* 505-508.

Maddux, J.E., Roberts, M.C., Sledden, E. A., & Wright, L. (1986). Developmental issues in child health psychology. *American Psychologist, 41*(1)*,* 25-34. doi: 10.1037/0003-066X.41.1.25

Makuch, A., & Reschke, K. (2001). Playing games in promoting childhood dental health. *Patient education and counseling*, *43*(1), 105-110.

Marks, D.F., Murray, M., Evans, B., & Estacio, E.V. (2011). *Health Psychology: Theory, Research and Practice* (3rd ed.)*.* London: Sage.

Marshall, N.S., Glozier, N., & Grunstein, R.R. (2008). Is sleep duration related to obesity? A critical review of the epidemiological evidence. *Sleep Medicine Reviews, 12,* 289-298.

Marshall, D., O’Donohoe, S., & Kilne, S. (2007). Families, food, and pester power: Beyond the blame game? *Journal of Consumer Behaviour, 6,* 164-181.

Mason, R. (2008). *Keeping Computer Kids Fit.* Retrieved from <http://www.wholefamily.com/aboutyourkids/children/computers_2.html>

Masson, J. (2004). The Legal Context. In Fraser, S., Lewis, V., Ding, S., Kellett, M. & Robinson, C, *Doing Research with Children and Young People.* (pp. 43-58). London: Sage.

Matsunaga, M. (2010). How to Factor-Analyze Your Data Right: Do’s, Don’ts, and How-To’s. *International Journal of Psychological Research, 3*(1)*,* 97-110.

McEvoy, P., & Richards, D. (2006). A critical realist rationale for using a combination of quantitative and qualitative methods. *Journal of Research in Nursing,11*(1)*,* 66-78.

McKechnie, J. & Hobbs, S. (2004). Childhood Studies. In Fraser, S., Lewis, V., Ding, S., Kellett, M. & Robinson, C. *Doing Research with Children and Young People.* (pp. 270-286). London: Sage.

McQuaid, E. L., Howard, K., Kopel, S. J., Rosenblum, K., & Bibace, R. (2002). Developmental concepts of asthma: Reasoning about illness and strategies for prevention. *Journal of applied developmental psychology*, *23*(2)*,* 179-194.

McWhirter, J. M., Collins, M., Bryant, I., Wetton, N. M., & Bishop, J. N. (2000). Evaluating Safe in the Sun', a curriculum programme for primary schools. *Health Education Research, 15*(2)*,* 203-217.

Mileham, R. (2008). *Powering up: Are computer games changing our lives?* West Sussex: Wiley.

Miller, S. A. (2007). *Developmental Research Methods* (3rd ed.). London: Sage.

Miquelon, P., Knauper, B., & Vallerand, R.J. (2012). Motivation and goal attainment. The role of compensatory beliefs. *Appetite, 58,* 608-615.

Morgan, D.L. (1998). *The focus group guidebook.* London: Sage.

Morrison, V. & Bennett, P. (2012). *An Introduction to Health Psychology* (3rd ed.). Essex: Pearson Education Limited.

Moynihan, P.J., Mulvaney, C.E., Adamson, A.J., Seal, C., Steen, N., Mathers, J.C., & Zohouri, F.V. (2007). The nutrition knowledge of older adults living in sheltered housing accommodation. *Journal of Human Nutrition Dietics, 20,* 446-458.

Mullarkey, D., Johnson, B., & Hackett, A. (2007). Portion size selection of fruits and vegetables by 9- 10-year old children in Liverpool. *Journal of Human Nutrition Diet, 20,* 459-466.

Mushi-Brunt, C., Haire-Joshu, D., & Elliott, M. (2007). Food Spending Behaviours and Perceptions are Associated with Fruit and Vegetable Intake Among Parents and Their Preadolescent Children. *Journal of Nutrition Education and Behaviour, 39*(1)*,* 26-30.

Myant, K.A., & Williams, J.M. (2005). Children’s concepts of health and illness: Understanding of contagious illnesses, non-contagious illnesses and injuries. *Journal of Health Psychology, 10*(6)*,* 805-819.

Natapoff, J.N. (1978). Children's views of health: a developmental study. *American Journal of Public Health, 68*(10*),* 995-1000.

National Obesity Forum. (2014). *Obesity in the UK: Analysis and Expectations.* Retrieved from <http://www.nationalobesityforum.org.uk/media/PDFs/StateOfTheNationsWaistlineObesityintheUKAnalysisandExpectations.pdf>

National Obesity Observatory. (2011). *Knowledge and attitudes towards healthy eating and physical activity: what the data tell us.* Retrieved from <http://www.noo.org.uk/uploads/doc/vid_11171_Attitudes.pdf>

National Obesity Observatory. (2014). *About Obesity.* Retrieved from <http://www.noo.org.uk/NOO_about_obesity>

NHS Direct. (2007). Retrieved from <http://www.nhsdirect.nhs.uk/articles/article.aspx?articleid=319>

NHS. (2008). *Why Eat 5 a Day?* Retrieved from <http://www.5aday.nhs.uk/WhyEat5aday/HealthBenefits.aspx>

NHS Choices. (2013). *Britain: 'the fat man of Europe'.* Retrieved from <http://www.nhs.uk/Livewell/loseweight/Pages/statistics-and-causes-of-the-obesity-epidemic-in-the-UK.aspx>

NHS Choices. (2013b). *The facts about sugar.* Retrieved from <http://www.nhs.uk/Livewell/Goodfood/Pages/sugars.aspx>

NHS Choices. (2014). *Tooth decay.* Retrieved from <http://www.nhs.uk/conditions/dental-decay/pages/introduction.aspx>

Nguyen-Duc, T.T. (2006). *Of Sleep and Sleep Debt.* Retrieved from <http://sleepdisorders.about.com/od/causesofsleepdeprivation/a/sleepdebt.htm>

Nunnally, J. (1978). *Psychometric Theory.* New York: McGraw Hill.

Nunnally, J.C., & Bernstein, I.H. (1994). *Psychometric Theory* (3rd ed.). New York: McGraw Hill.

O’Cathain, A., Murphy, E., & Nicholl, J. (2007). Why, and how, mixed methods research is undertaken in health services research in England: a mixed methods study. *BMC Health Services Research, 7,* 1-11. doi:10.1186/1472-6963-7-85

Oakes, M. E. (2005). Stereotypical thinking about foods and perceived capacity to promote weight gain. *Appetite*, *44*(3), 317-324.

Office for National Statistics. (2011). *Neighbourhood Statistics.* Retrieved from <http://www.neighbourhood.statistics.gov.uk/dissemination/NeighbourhoodSummary.do?profileSearchText=DE4+2QB&width=&a=3&i=1001&m=0&enc=1&tab=8&searchProfiles>=

Ogden, J. (2012). *Health Psychology: A text book* (5th ed.). Berkshire: Open University Press.

Onyango-Ouma, W., Aagaard-Hansen, J., & Jensen, B.B. (2004). Changing concepts of health and illness among children of primary school age in Western Kenya. *Health Education Research, 19*(3)*,* 326-339.

Page, A. S., Cooper, A. R., Griew, P., & Jago, R. (2010). Children's screen viewing is related to psychological difficulties irrespective of physical activity. *Pediatrics*, *126*(5), e1011-e1017.

Pallant, J. (2007). *SPSS Survival Manual* (3rd ed.). Berkshire: Open University Press.

Palmer, S. (2006). *Toxic childhood: How the modern world is damaging our children and what we can do about it.* London: Orion.

Parmenter, K., Waller, J., & Wardle, J. (2000). Demographic variation in nutrition knowledge in England. *Health Education Research, 15,* 163-174.

Pastorelli, C., Caprara, G. V., Barbaranelli, C., Rola, J., Rozsa, S., & Bandura, A. (2001). The structure of children's perceived self-efficacy: A cross-national study. *European Journal of Psychological Assessment*, *17*(2), 87.

Patel, A. I., & Ritchie, L. (2013). Striving for Meaningful Policies to Reduce Sugar-Sweetened Beverage Intake Among Young Children. *Pediatrics*, *132*(3), 566-568.

Patton, M. C. (2002). *Qualitative Research and Evaluation Methods* (3rd ed.). London: Sage.

Pearson, N., Biddle, S. J., & Gorely, T. (2009). Family correlates of fruit and vegetable consumption in children and adolescents: a systematic review. *Public health nutrition*, *12*(02), 267-283.

Pedhauzer, E.J., & Schmelkin, L.P. (1991). *Measurement, Design and Analysis: An Integrated Approach.* New Jersey: Lawrence Erlbaum Associates.

Pesudovs, K., Burr, J. M., Harley, C., & Elliott, D. B. (2007). The development, assessment, and selection of questionnaires. *Optometry & Vision Science*, *84*(8), 663-674.

Pett, M.A., Lackey, N.R., & Sullivan, J.J. (2003). *Making sense of factor analysis: the use of factor analysis for instrument development in health care research.* Thousand Oaks: Sage.

Piaget, J. (1930). *The child’s conception of the world/translated by Joan and Andrew Tomlinson.* London: Paladin.

Piaget, J., & Inhelder, B. (1969). *The psychology of the child/translated by H.Weaver.* London: Routledge.

Piché, G., Fitzpatrick, C., & Pagani, L. S. (2012). Kindergarten Self‐Regulation As a Predictor of Body Mass Index and Sports Participation in Fourth Grade Students. *Mind, Brain, and Education*, *6*(1), 19-26.

Piggin, J., & Lee, J. (2011). 'Don’t mention obesity': Contradictions and tensions in the UK Change4Life health promotion campaign. *Journal of health psychology*, 1359105311401771.

Piko, B. F., & Bak, J. (2006). Children's perceptions of health and illness: images and lay concepts in preadolescence. *Health Education Research, 21*(5)*,* 643-653.

Pion, I. A., Kopf, A. W., Hughes, B. R., Wetton, N. M., Collins, M., & Newton-Bishop, J. A. (1997). Teaching Children About Skin Cancer: The Draw‐and‐Write Technique as an Evaluation Tool. *Pediatric Dermatology, 14*(1)*,* 6-12.

Poelman, M.P., Vermeer, W.M., Vyth, E.L., & Steenhuis, H.M. (2013). ‘I don't have to go to the gym because I ate very healthy today’: the development of a scale to assess diet-related compensatory health beliefs. *Public Health Nutrition, 16*(2)*,* 267-273.

Porcellato, L., Dughill, L. & Springett, J. (2002). Using focus groups to explore children’s perceptions of smoking: reflections on practice. *Health Education, 102*(6), pp 310-320.

Porcellato, L., Dugdill, L., Springett, J., & Sanderson, F. H. (1999). Primary schoolchildrens' perceptions of smoking: implications for health education. *Health Education Research, 14*(1)*,* 71-83.

Pridmore, P. (1996). Visualizing health: Exploring perceptions of children using the draw-and-write method. *Promotion & Education, 3*(4)*,* 11-15.

Public Health England. (2013). *How healthy behaviour supports children’s wellbeing.* Retrieved from <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/232978/Smart_Restart_280813_web.pdf>

Puhl, R. M., & Latner, J. D. (2007). Stigma, obesity, and the health of the nation's children. *Psychological bulletin*, *133*(4), 557.

Rabiau, M., Knauper, B., & Miquelon, P. (2006). The eternal quest for optimal balance between maximising pleasure and minimising harm: the compensatory health beliefs model. *British Journal of Health Psychology, 11,* 139-153.

Rabiau, M.A., Knauper, B., Nguyen, T.K., Sufrategui, M., & Polychronakos, C. (2009). Compensatory beliefs about glucose testing are associated with low adherence to treatment and poor metabolic control in adolescents with type 1 diabetes. *Health Education Research, 24,* 890-896.

Radnitz, C., Byrne, S., Goldman, R., Sparks, M., Gantshar, M., & Tung, K. (2009). Food cues in children's television programs. *Appetite*, *52*(1), 230-233.

Radtke, T., Kaklamanou, D., Scholz, U., Hornung, R., & Armitage, C.J. (2014). Are diet-specific compensatory health beliefs predictive of dieting intentions and behaviour? *Appetite, 76,* 36-43.

Radtke, T., & Scholz, U. (2012). “Enjoy a delicious cake today and eat healthily tomorrow”: compensatory health beliefs and their impact on health. *The European Health Psychologist, 14,* 37-40.

Radtke, T., Scholz, U., Keller, R., & Hornung, R. (2012). Smoking is ok as long as I eat healthily. Compensatory Health Beliefs and their role for intentions and smoking within the Health Action Process Approach. *Psychology and Health, 27*(2)*,* 91-107.

Radtke, T., Scholz, U., Keller, R., Knauper, B., & Hornung, R. (2011). Smoking-specific Compensatory Health Beliefs and the readiness to stop smoking in adolescents. *British Journal of Health Psychology, 16*(3)*,* 610-625.

Ragin, D.F. (2011). *Health Psychology: An Interdisciplinary Approach to Health: International Edition*. Boston: Pearson.

Rahal, C. J., Bryant, J. B., Darkes, J., Menzel, J. E., & Thompson, J. K. (2012). Development and validation of the compensatory eating and behaviors in response to alcohol consumption scale (CEBRACS). *Eating Behaviors*, *13*(2), 83-87.

Rayner, M. & Scarborough, P. (2005). The burden of food related ill health in the UK. *Journal of Epidemiology Community Health, 59,* 1054-1057.

Reilly, J.J. (2008). Physical activity, sedentary behaviour and energy balance in the preschool child: opportunities for early obesity prevention. *Proceedings of the Nutrition Society, 67*(3)*,* 317-325. DOI: <http://dx.doi.org/10.1017/S0029665108008604>

Robinson, C. & Kellet, M. (2004). Power. In Fraser, S., Lewis, V., Ding, S., Kellett, M. & Robinson, C. *Doing Research with Children and Young People.* (pp. 81-96). London: Sage.

Rodearmel, S. J., Wyatt, H. R., Barry, M. J., Dong, F., Pan, D., Israel, R. G., Cho, S. S., McBurney, M. I., & Hill, J. O. (2006). A Family‐Based Approach to Preventing Excessive Weight Gain. *Obesity*, *14*(8), 1392-1401.

Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education & Behavior*, *2*(4), 328-335.

Rozin, P. (1996). The socio-cultural context of eating and food choice. In *Food choice, acceptance and consumption* (pp. 83-104). Springer US.

Sacks, H., Schegloff, E., & Jefferson, G. (1977). The Simplest Systematics for Turntaking in Conversation. *Language, 50,* 696–735.

Savage, J. S., Fisher, J. O., & Birch, L. L. (2007). Parental influence on eating behavior: conception to adolescence. *The Journal of Law, Medicine & Ethics*, *35*(1), 22-34.

Schwartz, M. B., & Brownell, K. D. (2004). Obesity and body image. *Body image*, *1*(1), 43-56.

Schwarzer, R. (1992). Self-efficacy in the adoption and maintenance of health behaviors: Theoretical approaches and a new model. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 217-242). Washington, DC: Hemisphere.

Siegler, R.S., & Alibali, M.W. (2005). *Children’s Thinking* (4th ed.). New Jersey: Pearson Prentice Hall.

Sigman, A. (2012). Time for a view on screen time. *Archives of Disease in Childhood,*.doi:10.1136/archdischild-2012-302196

Smith, J. A. (1996). Beyond the divide between cognition and discourse: Using interpretative phenomenological analysis in health psychology. *Psychology and Health, 11,* 261-271.

Sniehotta, F.F., Nagy, G., Scholz, U., & Schwarzer, R. (2006). The role of action control in implementing intentions during the first weeks of behaviour change. *British Journal of Social Psychology, 45*(1)*,* 87-106.

Speakman, J., Hambly, C., Mitchell, S., & Krol, E. (2007). Animal models of obesity. *Obesity Reviews, 8,* 55-61.

Spector, P. E. (1992). *Summated rating scale construction: An introduction* (No. 82).London: Sage.

Staiano, A. E., & Calvert, S. L. (2011). Exergames for physical education courses: Physical, social, and cognitive benefits. *Child development perspectives*, *5*(2), 93-98.

Streiner, D.L., & Norman.G.R. (1995). *Health Measurement Scales: a Practical Guide to their Development and Use* (3rd ed.)*.* Oxford: Oxford University Press.

Stunkard, A. J., Sørensen, T., & Schulsinger, F. (1983). Use of the Danish Adoption Register for the study of obesity and thinness. *Research publications-Association for Research in Nervous and Mental Disease*, *60*, 115.

Suton, D., Pfeiffer, K. A., Feltz, D. L., Yee, K. E., Eisenmann, J. C., & Carlson, J. J. (2013). Physical Activity and Self-efficacy in Normal and Over-fat Children. *American Journal of Health Behavior*, *37*(5), 635-640.

Sutton, S. (1998). Predicting and explaining intentions and behavior: How well are we doing?. *Journal of applied social psychology*, *28*(15), 1317-1338.

Tabachnick, B.G., & Fiddell, L.S. (2007). *Using multivariate statistics* (5th ed.). Boston: Pearson Education.

Tammelin, T., Nayha, S., Hills, A.P., & Jarvelin, M.R. (2003). Adolescent participation in sports and adult physical activity. *American Journal of Preventive Medicine, 24,* 22-28.

Tan, C. C., & Holub, S. C. (2011). Children’s self-regulation in eating: Associations with inhibitory control and parents’ feeding behavior. *Journal of pediatric psychology*, *36*(3), 340-345.

Taut, D., & Baban, A. (2008). Examination of the relationship between self-regulation strategies and healthy eating patterns in coronary heart disease patients. The relevance of Compensatory Health Beliefs. *Cognition, Brain & Behaviour, 12,* 219-231.

Thompson, K., Blunden, S., Brindal, E., & Hendrie, G. (2011). When food is neither good nor bad: Children’s evaluations of transformed and combined food products. *Journal of Child Health Care*, 1367493511414449.

Tiggemann, M., & Wilson‐Barrett, E. (1998). Children's figure ratings: Relationship to self‐esteem and negative stereotyping. *International Journal of Eating Disorders*, *23*(1), 83-88.

Truby, H., & Paxton, S. J. (2002). Development of the children's body image scale. *British Journal of Clinical Psychology*, *41*(2), 185-203.

Turner-Cobb, J. (2014). *Child Health Psychology: A Biopsychosocial Perspective.* London: Sage.

Videon, T.M., & Manning, C.K. (2003) Influences on adolescent eating patterns: the importance of family meals. *Journal of Adolescent Health, 32*(5)*,* 365-373.

von Suchodoletz, A., Trommsdorff, G., & Heikamp, T. (2011). Linking maternal warmth and responsiveness to children's self‐regulation. *Social Development*, *20*(3), 486-503.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Walsh, M.E., & Bibace, R. (1991). Children's Conceptions of AIDS: A Developmental Analysis. *Journal of Pediatric Psychology, 16*(3)*,* 273-285.

Wammes, B., Breedveld, B., Kremers, S., & Brug, J. (2006). The ‘balance intervention’ for promoting caloric compensatory behaviours in response to overeating: a formative evaluation. *Health Education Research, 21*(4)*,* 527-537.

Wammes, B., French, S., & Brug, J. (2007). What young Dutch adults say they do to keep from gaining weight: self-reported prevalence of overeating, compensatory behaviours and specific weight control behaviours. *Public Health Nutrition, 10*(8)*,* 790-798.

Wansink, B., & Sobal, J. (2007). Mindless eating: The 200 daily food decisions we overlook. *Environment and Behavior, 39,* 106-123.

Wardle J., Carnell S., & Cooke, L. (2005). Parental control over feeding and children's fruit and vegetable intake: how are they related? *Journal of American Dietic Association,105*(2)*,* 227-32.

Waumsley, J. (2011). Introduction. In Obesity in the UK: A psychological perspective. *Obesity Working Group 2011* (pp. 33-5). Leicester: The British Psychological Society.

Waumsley, J., & Mutrie, N. (2011). Physical Activity and Exercise Psychology: Our Role in healthy weight management for adults. In Obesity in the UK: A psychological perspective. *Obesity Working Group 2011* (pp. 5-15). Leicester: The British Psychological Society.

Weiner, B., Perry, R. P., & Magnusson, J. (1988). An attributional analysis of reactions to stigmas. *Journal of personality and social psychology*, *55*(5), 738.

Weinstein, N.D. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology, 39,* 806-820.

Wellman, H.M., Cross, D., & Watson, J. (2001). Meta-Analysis of Theory-of-Mind Development: The Truth about False Belief. *Child Development, 72 (3),* 655-684. DOI: 10.1111/1467-8624.00304

Wetton, N., & Moon, A. (1989). *A way in: Five key areas of health education.* Health Education Authority.

WHO. (2003). *Diet, nutrition and the prevention of chronic diseases. Report of the joint WHO/FAO expert consultation. TRS 916.* Geneva: WHO.

Wieber, F., von Suchodoletz, A., Heikamp, T., Trommsdorff, G., & Gollwitzer, P. M. (2011). If-then planning helps school-aged children to ignore attractive distractions. *Social Psychology*, *42*(1), 39.

Wiggers, L.C., de Wit, J.B., Gras, M.J., Coutinho, R.A., & van den Hoek, A. (2003). Risk behavior and social-cognitive determinants of condom use among ethnic minority communities in Amsterdam. *AIDS Education and Prevention, 15*(5)*,* 430-447.

Wilkinson, S. (2008). Focus Groups. In J. Smith, *Qualitative Psychology A Practical Guide to Research Methods* (2nd ed.) (pp 186-206). London: Sage.

Wilkinson, S., Joffe, H., & Yardley, L. (2004). Qualitative data collection: interviews and focus groups. In Marks, D. F. & Yardley, L. *Research Methods for Clinical and Health Psychology.* (pp 39-55). London: Sage.

Williams, T., Wetton, N. M., & Moon, A. (1989). *A Way In: Five Key Areas of Health Education.* London: HEA.

Willets, B. (2014). *The Effects of Eating Sweets.* Retrieved from <http://www.livestrong.com/article/500696-the-effects-of-eating-sweets/>

Willig, C. (2008). *Introducing Qualitative Research in Psychology.* Berkshire: Open University Press.

Woods, S. E., Springett, J., Porcellato, L., & Dugdill, L. (2005). ‘Stop it, it's bad for you and me’: experiences of and views on passive smoking among primary-school children in Liverpool. *Health Education Research, 20*(6)*,* 645-655.

World Health Organisation. (2014). *Global Strategy on Diet, Physical Activity and Health.* Retrieved from <http://www.who.int/dietphysicalactivity/childhood_what/en/>

Yoshida, M., McKeown, N.M., Rogers, G., Meigs, J.B., Saltzman, E.D., Agostino, R., & Jacques, P.F. (2007). Surrogate Markers of Insulin Resistance are Associated with Consumption of Sugar-Sweetened Drinks and Fruit Juice in Middle and Older-Aged Adults. *Journal of Nutrition,* 137, 2121-2127.

Zeinstra, G.G., Koelen, M.A., Kok F.J., & de Graaf, C. (2007). Cognitive development and children's perceptions of fruit and vegetables; a qualitative study. *International Journal of Behavioral Nutrition and Physical Activity, 4*,doi:10.1186/1479-5868-4-30