A STUDY TO EVALUATE THE NUTRITIONAL HABITS OF YEAR 6 CHILDREN, BEFORE AND AFTER A NUTRITION-BASED INTERVENTION: THE CHANGE! (CHILDREN'S HEALTH, ACTIVITY, AND NUTRITION: GET EDUCATED!) PROJECT

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Abstract

Poor nutrition and impaired dietary intakes are associated with certain chronic disease states such as obesity, cardiovascular disease and diabetes. There have been a number of school-based, nutrition-focused interventions which have been used to measure and determine healthy eating behaviours in UK school children but with varying degrees of success. The main aim of this thesis was to develop, pilot and evaluate the Children's Health, Activity and Nutrition: Get Educated! (CHANGE!), a healthy eating curriculum for year 6 children.

A formative study, unique in this type of intervention study, was carried out to investigate the behaviours, habits and attitudes to food of the children and the data collected used to inform the design of the intervention teaching curriculum. It revealed the diversity of the food and eating environments to which the children were exposed. Some of their perceptions about health and food, food choices and eating behaviours were inter-related. The key health messages included in the teaching curriculum were developed from these findings.

At baseline, the participants' food intakes, knowledge about food and nutrition and their attitudes to eating were measured using questionnaires. Additionally anthropometric measurements were taken and the children's postcodes used to assess the socio-economic status of the children. The results showed that the control and intervention groups were alike at baseline.

At post-intervention, the results indicated that there were some positive changes to food intakes, with a slight decrease in the consumption of negative marker foods. There was an increase in the total mean food knowledge scores, with children from the areas of lower deprivation scoring highest. There was no significant difference between control and intervention groups. The children's eating attitudes displayed some trends with cues to eating. There was a significant increase in height in all children but this did not alter the body mass index status of the overweight or obese children.

The importance of the use of CHANGE! as an intervention at the school-level is demonstrated by some of the more important findings from the study, such as the increased self-assessed ability to make certain foods, and that there was an increase in total food knowledge scores from the children who lived in areas of lower deprivation. These results could potentially be the starting point for some children to start questioning the types of food they are habitually eating and maybe looking to make some adjustments to their behaviours, as even small changes can be nutritionally significant in the longer-term for the future health of the children. Furthermore, the sustainability and long-term effects of CHANGE! need additional assessment and evaluation.

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Glossary of terms

BDA	British Dietetic Association
BL	Baseline
BMI	Body Mass Index
CHD	Coronary heart disease
CON	Control school/group
CVD	Cardiovascular disease
DRV	Dietary Reference Values
EAQ	Eating Attitudes Questionnaire
EAR	Estimated Average Requirement
EI	Energy intake
FFQ	Food frequency questionnaire
FIQ	Food intake questionnaire
FSM	Free school meals
FU	Follow-up
FV	Fruits and vegetables
IFS	Institute for Fiscal Studies
IMD	Indices of Multiple Deprivation
INT	Intervention school/group
IOTF	International Obesity Task Force
NCMP	National Child Measurement Programme
NDNS	National Diet and Nutrition Survey
NHS	National Health Service
NICE	National Institute for Clinical Excellence
NMA	Neighbourhood Management Areas
NMES	Non-milk extrinsic sugars
NMF	Negative marker food
NSP	Non-starch polysaccharide
PA	Physical activity
PCT	Primary Care Trust
PI	Post-intervention
PMF	Positive marker food
PSHE-C	Personal, Social, Health and Education and Citizenship
SACN	Scientific Advisory Committee on Nutrition

SFA	Saturated fatty acid
SES	Socio-economic status
SSSD	Sugar-sweetened soft drinks
UIFSM	Universal Infant Free School Meals
WHO	World Health Organisation

Chapter 1
Introduction

1. Introduction

The CHANGE! project (Children's Health, Activity and Nutrition: Get Educated!) was a collaborative research study, led by Liverpool John Moores University, with the full support of Wigan Council's Personal, Social and Health Education, and Citizenship (PSHE-C) team and Ashton, Leigh and Wigan Primary Care Trust. There were three areas of investigation to the study: nutrition, physical activity (PA) and cardiometabolic health. CHANGE! was a pilot study which aimed to improve the health and well-being of children in Wigan by investigating the eating habits and physical activity levels of the children, plus further investigation of blood lipid biomarkers and the movement skills of a sub-sample of the children.

This thesis presents the results from the nutrition part of the study. The food intake, food knowledge, and eating behaviours and habits of year 6 children (aged 10 to 11 years) in Wigan were explored, both before and after the delivery of a healthy eating intervention in randomly selected schools and compared to other schools selected as control schools.

Historically, schools have been recognised as valuable settings in which to educate children about healthy eating, and to influence policy measures and food provision (Margetts 2004, World Health Organisation 2009). The advent of compulsory education in England and Wales in the late nineteenth century uncovered the problem of undernourished children in society, which impacted on their ability to learn (Morgan 2011). The 1906 Education Act facilitated the introduction of subsidised school meal provision (Bailey 1906). Additionally, post-Second World War legislation, the 1944 Education Act, made the provision of school meals and milk by local education authorities mandatory in primary and secondary schools (Morgan 2011).

These changes in the law to school food provision were borne out of the findings of public health studies carried out pre- and post-Second World War, for example, by McGonigle and Kirby (1936). Using data from 1933, it was determined that a third of children in the North East of England required medical treatment or observation [(McGonigle and Kirby 1936) cited in (Bambra 2011)]. The reasons

cited for this were unemployment, poverty and the resultant under-nutrition and malnutrition (Bambra 2011). The Government had also realised at the end of the First World War, that their control during wartime over aspects of the UK population's lives and particularly the rationing of food, had actually improved the health of the poor (Walsh n.d.). This prompted the Government to utilise this evidence to implement public health measures in the school setting, to try to improve the health of children at the population level.

This commitment to public health measures which aimed to promote health in children, was jeopardised and subsequently abolished 40 years later by the 1980 Education Act and by the Local Government Act in 1988 (Morgan 2011). This was to such a degree that the increase in unhealthy diets and meals in schools over the next 20 years (Morgan 2011) has parallels with an escalation in obesity and overweightness in primary school-aged children, over the same period. The health of the nation has found itself under scrutiny once again.

In an effort to improve the health of children and their families, the current Coalition Government introduced the Children and Families Act 2014. This included the introduction of the School Food Standards in June 2014 (Department for Education 2014a) (see chapter 2, p.14 for more detail), and an entitlement to a free school meal for all Reception, Year 1 and Year 2 children in state-funded primary schools, since September 2014 (Department for Education 2014d).

1.1 Health and healthy eating

Health is defined as '*a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity*' (World Health Organisation, 1948). This definition encompasses not just the physical state of health but acknowledges that a person's mental health, surroundings, and environment also have an impact on his or her level of health and well-being. A holistic approach to the prevention and/or reduction in the occurrence of a particular disease or condition such as obesity is therefore a more preferable tactic than a pharmacological approach. Indeed this definition moves away from trying to prevent a specific problem, but more towards 'promoting health' by changing whole lifestyles and the root causes of ill health.

The concept of a holistic approach to preventing or reducing the occurrence of disease, has been around for more than 20 years (Golden and Earp 2012). Historically, health promotion outcomes were aimed at lifestyle and behaviour change, whilst disregarding the contexts in which people lived their lives and which therefore had influence on the state of their health (Golden and Earp 2012). This approach conformed to the traditional use of the Social Model of Health and the Medical Model route: either the social, cultural, political or environmental factors are remedied which are contributing to a particular state of health or disease, or science is used to treat or 'cure' the emerging illness and disease. Other models of approaches to health promotion, such as Brofenbrenner's work in 1977 on the ecological model of health which states that in order to understand human development, it is necessary to understand interactions between humans and their environment [(Bronfenbrenner 1977) cited in(Golden and Earp 2012)]. Later works by (McLeroy et al. 1988) reinforced and suggested that the levels of influence on health behaviours, and that the concept of a wholly medicinal, or a wholly sociological solution to a problem, had been revised.

Healthy eating, in conjunction with being physically active and other positive lifestyle choices, are particularly important for children and adolescents, in order to promote their well-being, growth and development (Weichselbaum and Buttriss 2011). It has been shown that childhood health status can be tracked and associated with some adult health characteristics, such as body weight, blood pressure, and blood lipids (Buttriss 2005). The utilisation and implementation of initiatives to assist children and their families to improve their health and well-being as they get older, must take into account not just healthy eating and physical activity guidelines issued from professionals, but also the social and cultural influences that impact on aspects of their normal lives (Buttriss 2005). What must also be considered, however, when designing and implementing healthy eating initiatives, particularly for this age group and younger, is that often these children are not in control of the food choices in the household or even when eating outside of the home, for example, in school. Therefore the involvement and engagement of the family and the school in the intervention or initiative, is paramount if the intervention is to have an effect. CHANGE! aimed to address this by utilising the school environment for the delivery of the

CHANGE! healthy eating teaching curriculum, and with the use of homework tasks which would involve the family at home.

An 'obesogenic environment' is defined as: *'The sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations'* (Burgoine et al. 2009)(p.157). Elements of this obesogenic environment which can affect an individual's or a population's health, need to be more fully understood to start to reduce the prevalence of obesity. These include the balance between an individual and their genetic predisposition to weight gain, the psychological, social, cultural, economic and political components (Adamson and Mathers 2004, Lean et al. 2007); hence the need for an holistic approach. These factors will potentially, albeit unconsciously impact on food choices for an individual or population.

This study aimed to address some of the factors that affect food choice by getting the children to examine and quantify particular areas of eating behaviour such as measuring the amount of sugar they were consuming from sugar-sweetened soft drinks (SSSD) and suggesting healthier alternatives by getting the children to look at food labelling, how this intake could be balanced with PA, why breakfast might improve how well you work at school and what would be good breakfast choices. The aim was to suggest small changes that would be achievable for the children so that they could make informed food choices, whatever environment they were exposed to, and that would have a positive impact long-term. This is concurrent with the concept of narrowing the 'energy gap' which promotes the establishment of achievable small changes to energy intake and expenditure (increasing PA) which should be adequate to prevent excess weight gain in populations (Peters et al. 2012).

There is much evidence to suggest a relationship between poor nutrition and impaired dietary intake with chronic disease states, such as obesity, cardiovascular disease (CVD), and diabetes (Adamson and Mathers 2004, Brownell and Wadden 1992, Neumark-Sztainer et al. 1999). Additionally for children, their growth and development may be affected by an inadequate diet (Weichselbaum and Buttriss 2011). In the longer term, as well as contributing to

growth and developmental issues, future eating behaviours and food preferences as an adult may be influenced by a poor quality diet as a child (Weichselbaum and Buttriss 2011).

1.2 Wigan

This study centred on Wigan in North West England and figures for 2008 indicate that the collective area of Ashton, Leigh and Wigan had a population of just under 307,000 (Wigan Council 2009). Wigan is a Spearhead area which means that within the borough great health inequalities have been identified between areas (Public Health England 2013). The health of people in Wigan is significantly worse across a number of indicators than the English average including deprivation in communities, number of obese adults, diagnosis of diabetes, and early deaths from heart disease, stroke, and cancer – all diet-related conditions (Association of Public Health Observatories and Department of Health 2012). In Wigan, 19.9% of year 6 boys and 16.2% of year 6 girls are obese (Harrison et al. 2009). This is concordant with the English average of 20% and 16.5% respectively. There is therefore much scope for health promotion in Wigan, and Wigan Council and the Primary Care Trust (PCT) responded to the challenge as CHANGE! was being developed in 2009-2010. At the time of writing, however, as the PCT is no longer in existence, the 'Children and Family – Food and Health Team' which promotes healthy eating and teaches cookery skills, is now embedded in the Bridgewater Community Healthcare NHS Trust, whilst the Fit 4 Fun Academy is still run by Wigan Council (see page 7).

1.3 Intervention

The CHANGE! project was an intervention study, utilising the 'Planet Health' (Carter et al. 2007) and its sister publication 'Eat Well and Keep Moving' (Cheung et al. 2007) teaching programmes. Permission had previously been sought by the Principle Investigator for CHANGE!, and granted by the publishers, for the CHANGE! study to utilise and anglicise sections of the 'Planet Health' and 'Eat Well and Keep Moving' teaching programmes, to create the CHANGE! 20-week teaching curriculum. These evidence-based programmes had been used successfully in the United States (Gortmaker et al. 1999b, Wiecha et al. 2004) and also trialled in the south-west of England (Kipping et al. 2010). In these

studies, Planet Health displayed effective implementation into the schools with high teacher co-operation and satisfaction ratings (Wiecha et al. 2004). Gortmaker *et al*. (1999) measured the prevalence of obesity in their participants and the results demonstrated a reduction in obesity in their female intervention participants. The UK study by Kipping *et al*. (2010) showed that the children from the intervention schools, compared to the children from the control schools, were more likely to have increased the number of portions of fruits and vegetables (de Lauzon-Guillain et al. 2006) they consumed per day. The premise behind the programmes was to teach health education – specifically nutrition and PA – as part of a novel and interdisciplinary curriculum. The CHANGE! curriculum was designed to combine learning about nutrition and PA, whilst building skills as laid out in the National Curriculum, such as mathematics, science, and PSHE-C. The material chosen for CHANGE! from 'Planet Health' and 'Eat Well and Keep Moving' was based on aspects of the dietary guidelines in the UK during 2009 to 2010. These included eating five or more servings of fruits and vegetables each day, and limiting intakes of foods high in added sugar and saturated fat. Other aspects of the programme were anglicised from the American edition such as the names of food products and units of measurement. The CHANGE! curriculum was designed to be delivered in the intervention schools by the teaching staff responsible for year 6. The control schools received the teaching materials once the intervention was completed.

At a local level, as previously mentioned (p.6), Wigan Council provided specialist treatment programmes for children and their families who required guidance in making changes to their lifestyles to reduce levels of overweightness and increase their healthful behaviours. Such programmes included Fit Friendz and the Fit 4 Fun Academy. Although the success of these programmes is in the process of being evaluated, they were only able to provide a service to and support a small number of the overweight and obese children and adolescents of Wigan. CHANGE! aimed to reach a larger proportion of <u>all</u> children, regardless of weight status, within the borough, by being delivered in the school setting.

1.4 The intervention planning model

This study aimed to develop, pilot, and evaluate a healthy eating intervention for year 6 children, by engaging them in a teaching curriculum taught at their school so that they would feel empowered to make improvements to their lifestyles, no matter how small. To develop a successful nutrition-based intervention, an appropriate intervention planning model was needed, which would develop and augment the strengths and assets of the target group (National Institute for Health and Clinical Excellence 2007) (NICE).

The PRECEDE-PROCEED model (Predisposing Reinforcing and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation – Policy, Regulatory and Organisational Constructs in Educational and Environmental Development) (Green et al. 1980) (See Figure 1.1) was employed as the intervention planning model with which to do this.

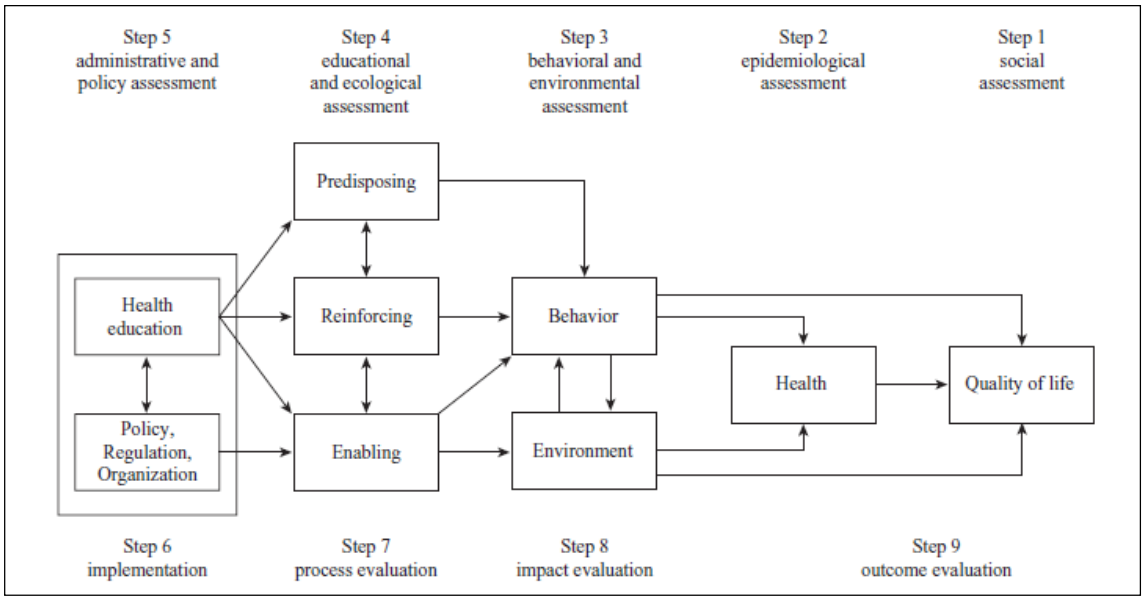

Figure 1.1: PRECEDE-PROCEED Planning Model
(Source: (Green and Kreuter 2005) p.34, cited in (Crosby and Noar 2011)

The PRECEDE part of the model analyses quality of life, health, behaviour and environmental factors, which are the predisposing, reinforcing, and enabling determinants (Kok et al. 2004). The PROCEED part of the model is for the development, implementation and evaluation of a health promotion intervention (Kok et al. 2004). In its simplest terms it allows for participation of the client (in

this instance the year 6 children and their families) in the process so that they can determine their behaviour and health outcomes by voluntary active involvement. By helping the target population to assess their own needs and barriers, compliance to a tailored programme is more likely to be successful and sustainable for the participants (Cole and Horacek 2009, Lean et al. 2007).

With regard to each stage or 'phase' of the model, Phase 1 '*social assessment*' aimed to determine people's perceptions of their own needs and quality of life by use of data-collection activities such as focus groups and surveys (Glanz et al. 2002). The 'assessment' in this instance was the poor nutrition and low PA levels in Wigan, leading to increased risk of obesity and the development of associated health problems, such as CVD and type 2 diabetes. Formative work in the form of focus groups was carried out for this phase. This work is reported in Boddy et al. (2012) (See appendix 9.8).

For Phase 2 '*epidemiological assessment*', the health issues which were considered the most important for the participant groups were considered. This highlighted that obesity figures for year 6 boys and girls in England at the time (2009/10) were 20.4% and 17.0% respectively (National Obesity Observatory 2013b) and that almost one third of deaths from coronary heart disease (CHD) are attributable to unhealthy diets (Department of Health, 1996). These statistics and national surveys can provide indicators of morbidity and mortality to help identify specific groups at risk (Glanz et al. 2002). From this data therefore, the goals for CHANGE! to address were the engagement of the target population leading to a proposed increase in self-efficacy. This could lead to an increase in their healthful behaviours such as improving the quality of their nutritional intakes and consequently reduce the incidence of overweight and obesity in the year 6 children.

Phase 3 '*behavioural and environmental assessment*' involved assessing the factors that might contribute to the identified health problem, and whether the existing behaviours of the population at risk, are contributing to the occurrence and severity of the problem (Glanz et al. 2002). Behavioural factors can be addressed through intervention but environmental factors are more difficult to

modify and would be more likely to happen as a result of policy change rather than as a result of education (Glanz et al. 2002). An example of this would be the availability of unhealthy food in school which would require a policy change within the school, rather than, or as well as, just educating the children about healthy eating. A change at policy level by the Government, in the nutritional standards of school foods did occur prior to the roll-out of CHANGE! in the autumn of 2010 and is discussed in further detail in chapter 2 (p.14).

This was addressed by CHANGE! through the types of questions presented in the focus groups to assess some of their existing eating and nutritional behaviours, to get an insight into how the children viewed their eating habits and what influences were present. Example of questions which were asked included:

- What does it feel like when you're hungry? (*Describe how you feel*).
- What makes you want to eat? (*e.g. adverts, smells, boredom, loneliness, upset, happy, etc.*)
- Describe a normal mealtime with your family to me (*e.g. who cooks, where the meal is eaten, who is present at the meal, what is eaten, first to finish etc*.)

For more detail see Boddy et al. (2012) (See appendix 9.8).

Phase 4 '*educational and ecological assessment*' identified the *predisposing, reinforcing,* and *enabling* factors that need to be present during the process, and that they are there to initiate and sustain the changes made (See table 1.1, p.11).

Table 1.1: Examples of questions used to determine the predisposing, reinforcing and enabling factors in CHANGE!

Phase 4 stages	**Examples of questions used during the focus groups**
Predisposing factors: motivation or rationale for the behaviour	*What do you think you can do to stay healthy?* *Which foods help you to stay healthy?* *Why do you think you should have a healthy diet?*
Reinforcing factors: factors that provide a continuing reward or incentive for continuing persistence or repetition of a behaviour	*What would encourage you to reach a set goal?* *If you have been good, how do you get rewarded by your parents or teachers? (Treats? Food treats?)*
Enabling factors: antecedents to behaviour that allow a motivation to be realised	*What kinds of foods can you have for school dinners? (What would you like to have?)* *Would you like to learn to cook? (why/why not?)*

Phase 5 '*administration and policy assessment*' is there to identify any aspect that might facilitate or hinder the implementation of the intervention, such as policies or resources (Glanz et al. 2002). These might include specific local authority policies, school policies or the resources available to the school, for instance. Once these factors have been addressed, the PROCEED part of the model is 'implemented' (Phase 6 of the intervention planning model), which in this case, was implementation of the CHANGE! curriculum into the intervention schools. The remaining phases of the PRECEDE-PROCEED model - phase 7: process evaluation, phase 8: impact evaluation and phase 9: outcome evaluation - are assessed in chapters 4, 5 and 6, where the outcomes of the study and the intervention are evaluated.

In addition, the intervention had to follow some basic guidelines for prevention interventions, such as they should benefit child health or development in other ways, such as self-esteem; target behaviours that are causally related to the development of obesity or to its maintenance; and target behaviours that are modifiable and measurable so that families are able to see that the changes they have made are making a difference (Whitaker 2003). This approach is in

accordance with the recommendation of 'full engagement' described in 'Securing Good Health for the Whole Population' (Wanless 2004), and was a major feature that would lead to empowered patients, resulting in the best outcomes, as they took ownership of their own health. It was noted that there was a lack of information concerning effectiveness of health promotion and what forms of intervention are best at improving health literacy and determining the various levels of literacy in different target populations (Wanless 2004). Indeed Michie et al (2009) commented that due to the many component parts of interventions designed to change health-related behaviours, that there is a large heterogeneity in effectiveness. This heterogeneity stems from what has been described as 'complexity' in intervention design and includes factors such as the difficulty of the behaviours of those receiving the intervention, and the degree of flexibility or tailoring of the intervention (Craig et al. 2008). CHANGE! aimed to overcome the latter problem by the use of the PRECEDE-PROCEED intervention planning model by tailoring the intervention to the target population to ensure compliance (Cole and Horacek 2009, Lean et al. 2007) which was a novel feature of the study.

1.5 Organisation of the thesis

The main theme of the thesis is determining the food intakes, knowledge and eating habits of year 6 children. A review of the literature is contained in **chapter 2**. The main themes addressed are food in schools, nutrition and health, diet quality, current UK children's dietary intakes of particular foods, the success of nutrition-based, school-based curriculum interventions; and the increasing interest in eating habits and behaviour change to modulate healthy behaviours and weight. **Chapter 3** will report the methodologies used in the study. **Chapter 4** presents the quantitative, baseline data and analysis for food intakes, food knowledge and eating attitudes from Phase Two of the study. **Chapter 5** provides analysis of the food intake, food knowledge, and eating habits data, post-intervention. **Chapter 6** presents the synthesis of the nutrition-based data. **Chapter 7** concludes the thesis with general recommendations regarding children and healthy eating, plus recommendations for future study.

1.6 Aim of the thesis

The aim of this research was to develop, pilot and evaluate a healthy eating intervention for year 6 children in the UK.

The objectives to achieve this were:

1. To determine the views, experiences and perceptions of a cohort of year 6 Wigan school children on food, eating habits and influences through the use of focus groups, leading to the development of a healthy eating intervention.
2. To determine food intakes, knowledge of foods, and the eating habits of the children using the 24-hour recall method, and general nutrition knowledge questionnaires.
3. To develop a school-based intervention for year 6 children.
4. To obtain anthropometric measurements to compare baseline data with post-intervention data to determine if there were any changes in body mass index (BMI) status following delivery of the intervention.
5. To evaluate the impact of this study on food intake, nutritional knowledge and eating habits of year 6 children as a result of the intervention.

Chapter 2

Literature review

2. Literature Review

It is well evidenced that some adverse health characteristics in adults, such as hyperlipidaemia, hypertension and obesity, can be traced back to childhood (Buttriss 2005). Implementation of initiatives and interventions to assist children and their families to improve their health and well-being as they get older, must take into account not just healthy eating and physical activity guidelines issued by the professionals, but also the social and cultural influences that impact on aspects of their normal lives (Buttriss 2005).

During the 1960s and 1970s, the promotion of healthy lifestyles was aimed at the prevention of non-communicable diseases and this relied upon an assumed understanding of behaviour change from the participant (Nutbeam 2000). It became apparent however that these programmes were only effective amongst the most 'educated' and most economically advantaged in the community (Nutbeam 2000). As a result, health promotion bodies began to consider theory-based models, on which to base interventions, such as Bandura's Social Cognitive Theory (1998) (Perry et al. 2008). Despite progress in the development of interventions, little impact has been made in retarding the advance of obesity or in reducing the gap in health status between different social and economic groups in society (Nutbeam 2000) and recently, the gap has been widening again.

The concept of health literacy began to emerge in the early 1970s (Nutbeam 2000) with the term first being used in 1974 (Simonds 1974). The World Health Organisation (WHO) defined health literacy as '*cognitive and social skills which determine the motivation and ability of individuals to gain access to and to understand and use information in ways which promote and maintain good health*' (World Health Organisation 1998). It refers not only to an ability to read, write and comprehend medical literature (Peerson and Saunders 2009) but also to the varied and complex health-related decisions made daily in the context of 'keeping well' rather than managing illnesses and conditions (Peerson and Saunders 2009). In order to be able to assess whether health promotion outcomes have been achieved, indicators associated with health literacy can be utilised. These include:

- Knowledge relevant to the problem of interest.
- Self-efficacy in completing defined tasks.
- Self-empowerment.
- Attitudes and behavioural intentions.
- Participation in health promotion programmes.

(Nutbeam 1998)

Räihä et al (2006) (p.117) described the health literacy of nutrition as:
'*the ability and capacity of [adolescents] to acquire, understand, interpret and adopt nutrition health-related information and skills as well as their ability to evaluate critically the information given in nutrition health education*.'
As such, this complex and multifaceted expectation presents a challenge to health promotion generally and to the adoption of healthier nutritional habits and behaviours.

2.1 Food in schools

Up until the late 1980's, school meal provision in schools in England had been mandatory but as discussed in chapter 1 (p. 2 and 3) the Thatcher government transformed the school meal provision from a compulsory service provided by the local education authority, to one which was provided at their discretion (Morgan 2011). This led to schools closing down their kitchens as the school meal provision came under tender to public sector caterers (Morgan 2011) and the prices of school meals at a national level were no longer controlled (Dimbleby and Vincent 2013) pricing them out of the range of some families. The consequence of this was the introduction of a low cost service, serving low quality food (Morgan 2011) to school children, and an increase in the number of children taking packed lunches to school.

This situation remained until 2005 when Jamie Oliver's investigation into the quality of food in schools triggered an important and timely change in the delivery of food in schools, at a national level (Dimbleby and Vincent 2013). The quality of food served in school meals came under scrutiny, as did the nutritional quality of the foods found in the children's packed lunches brought from home.

Legislation brought in, in 2007 - the 'Education (Nutritional Standards and Requirements for School Food) (Public Health England)' - states that all local authority maintained primary, secondary, special schools and pupil referral units in England must meet these standards (Dimbleby and Vincent 2013). This legislation currently has thirteen food-based standards for school lunches (Department for Education 2014a) which includes provision of fruits and vegetables, healthier drinks, including drinking water, and starchy foods, and a limitation on salt in foods, particular types of snack foods and deep-fried foods. There are also fourteen nutrient-based standards for school lunches which aim to increase the vitamin and mineral content of school foods, decrease the fat, saturated fat, non-milk extrinsic sugars (NMES) and the sodium/salt content of foods (Department for Education 2014a). The inclusion of these food- and nutrient-based standards into an education(al) setting, demonstrates why it '*matters*' that children are introduced to a '*good food culture as early as possible*' so that the benefits can be seen, and to prevent '*the damage that is being done to the nation's health, happiness and finances by bad diet'* (Dimbleby and Vincent 2013). In other words, it is not only the responsibility of the Department of Health to treat (or prevent) illness and disease resulting from a poor diet, but also that of the education system to inform and model a healthy eating culture.

Importantly, the CHANGE! teaching curriculum, which was delivered in the intervention schools as part of the pilot programme in the school academic year 2010-2011, had already considered that these aspects of school foods were important to child health and well-being. They were therefore selected and included as part of the 20-weeks of lesson plans.

In more recent developments since the CHANGE! project was piloted in 2010-2011, the current Coalition Government reintroduced Universal Infant Free School Meals (UIFSM) in primary schools from September 2014, following the recommendations of Dimbleby and Vincent (2013). The schools are obligated to provide a free school meal to every reception, year 1 and year 2 child attending a state-funded school (Department for Education 2014d). However since school meal provision became discretionary for the local authorities in the late 1980's and provision became part of a tender process for external providers, school

kitchens became redundant and their capability for in-house food provision was not maintained. This means that some primary schools, whilst able to provide a free school meal for its eligible children, they are not able to provide a hot lunchtime meal as part of the requirements, due to their lack of facilities. Schools have been encouraged to bid for funding to obtain the necessary facilities to provide a hot food choice at lunchtime (Department for Education 2014d).

The rationale for providing a nutritionally balanced, healthy meal at lunchtime is to help improve concentration in children, to help them achieve better academic results, to reduce obesity, and establish social cohesion (Children's Food Trust 2014, Dimbleby and Vincent 2013). There does not appear to be an England-wide analysis of the benefits to the lives of the children who are receiving UIFSM. Analysis of the success of the scheme, appears unfortunately to be based on the number of children who take up the scheme and is being monitored by the Government from a financial perspective on a termly basis (Department for Education 2014d). Those schools which fail to maintain uptake of UIFSM or have low uptakes, will not receive their third term payment, thereby jeopardising the rationale behind having the policy for UIFSM in place. This would also jeopardise the roll-out of the scheme to include the rest of the primary school years. Further funding for this policy for 2015-2016 will be considered as part of the next Spending Review. Further research is required to provide evidence of the positive outcomes that providing a healthy meal at lunchtime can have on infant children.

2.2 Nutrition and its role in health

The WHO definition of health (1998), as stated in the introduction, encompasses not just the physical state of health but acknowledges that a person's mental health, surroundings and environment also have an impact on his or her level of health and well-being. Therefore a holistic approach to the prevention and/or a reduction in the occurrence of a particular disease or condition such as obesity is a more preferable tactic than the medical treatment of it. Indeed the above definition moves away from trying to prevent a specific problem towards 'promoting health' by changing whole lifestyles and the 'root causes' of ill health.

Health promotion is described as a 'process' (Nutbeam 1998) and as such relies upon people taking control of their health either as individuals or populations (Nutbeam 1998). Participation is vital for the success of any health promotion activity. The Ottawa Charter (1986) defined health promotion as:
'…*the process of enabling people to exert control over the determinants of health and thereby improve their health*.'
(World Health Organisation 1986).

Health promotion requires actions that are directed towards changing those determinants of health that impact on an individual's health and those that they have control over, and also those factors which they have little or no control over such as social, economic and/or environmental conditions (Nutbeam 1998).

Indeed, Wanless (2004) stressed the importance of following healthy lifestyles, which included healthy eating and physical activity, to improve health, health inequalities and reduce costs to the National Health Service (NHS) (Department of Health 2004, Wall et al. 2009). It also looked to address those economic and environmental factors that potentially increase the risks to an individual's health (Wanless 2004).

Following 'Securing Good Health for the Whole Population' (Wanless 2004) came the report known as the 'Foresight' report: '*Tackling Obesities: Future Choices*' (2007). Whilst discussing the prevalence of obesity in the UK and its implications for the population, it acknowledged that aspects of society over the last fifty years had changed radically (Butland et al. 2007). These included changes in work patterns, increasing use of transport, and significant changes in food production and food sales (Butland et al. 2007).

As a result, major influences on eating habits, activity levels, physiological factors and psychological factors were identified and termed '*key determinant[s] of vulnerability*' (Butland et al. 2007). When the 'obesity map' was drawn (see a simplified obesity map, figures 2.1, p.20) it showed that the factors that can influence obesity are complex and often as a result of multi-component

behaviour. Therefore a single-component intervention to tackle it, is theoretically going to be ineffective (Butland et al. 2007).

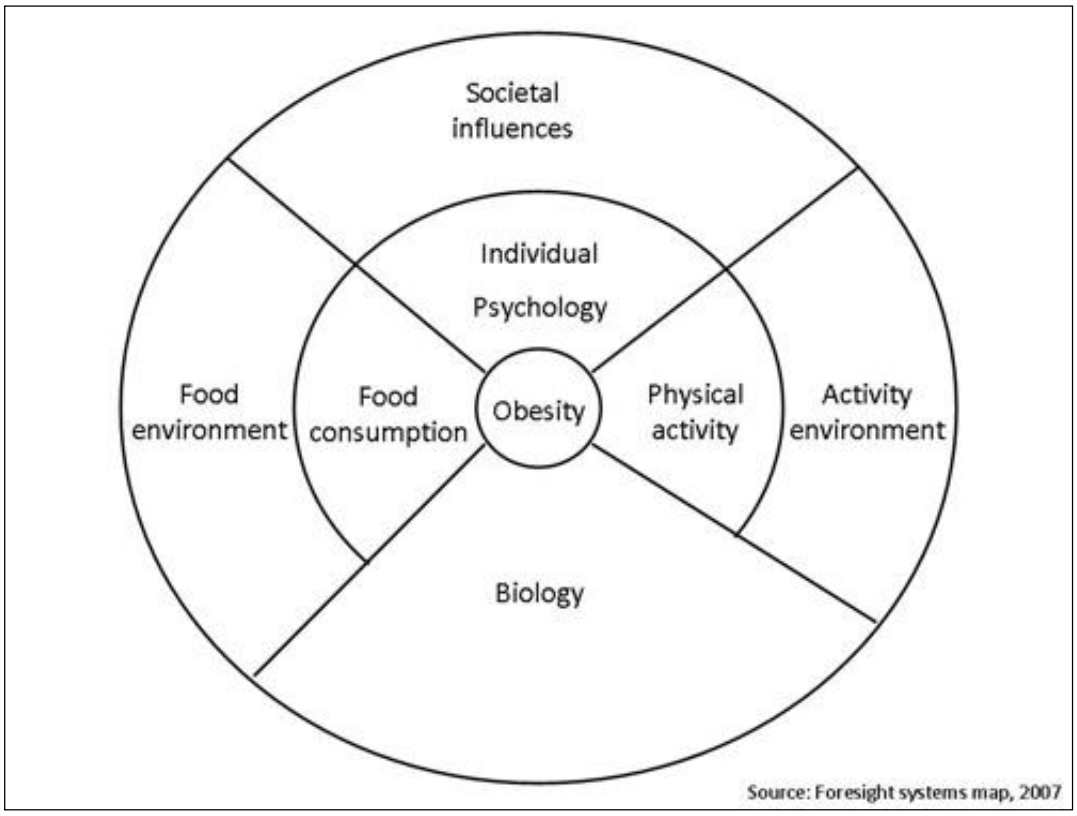

Figure 2.1: Simplified Foresight obesity map
(Source: (Butland et al. 2007), cited in (National Obesity Observatory 2013a)

In 2012, 14.4% of year 6 children in England, were classed as overweight and 19.0% as obese (Health and Social Care Information Centre 2012). Risk factors associated with becoming obese in childhood range from an imbalance in the energy input/energy expenditure ratio related to diet, and levels of physical activity and sedentary behaviour, to other less modifiable variables such as genetics and ethnicity (Kipping et al. 2008). Some of these developmental risk factors for obesity have stronger evidence than others, however unhealthy nutrition and diet practices have been shown to be positively associated with weight gain in children (Kipping et al. 2008).

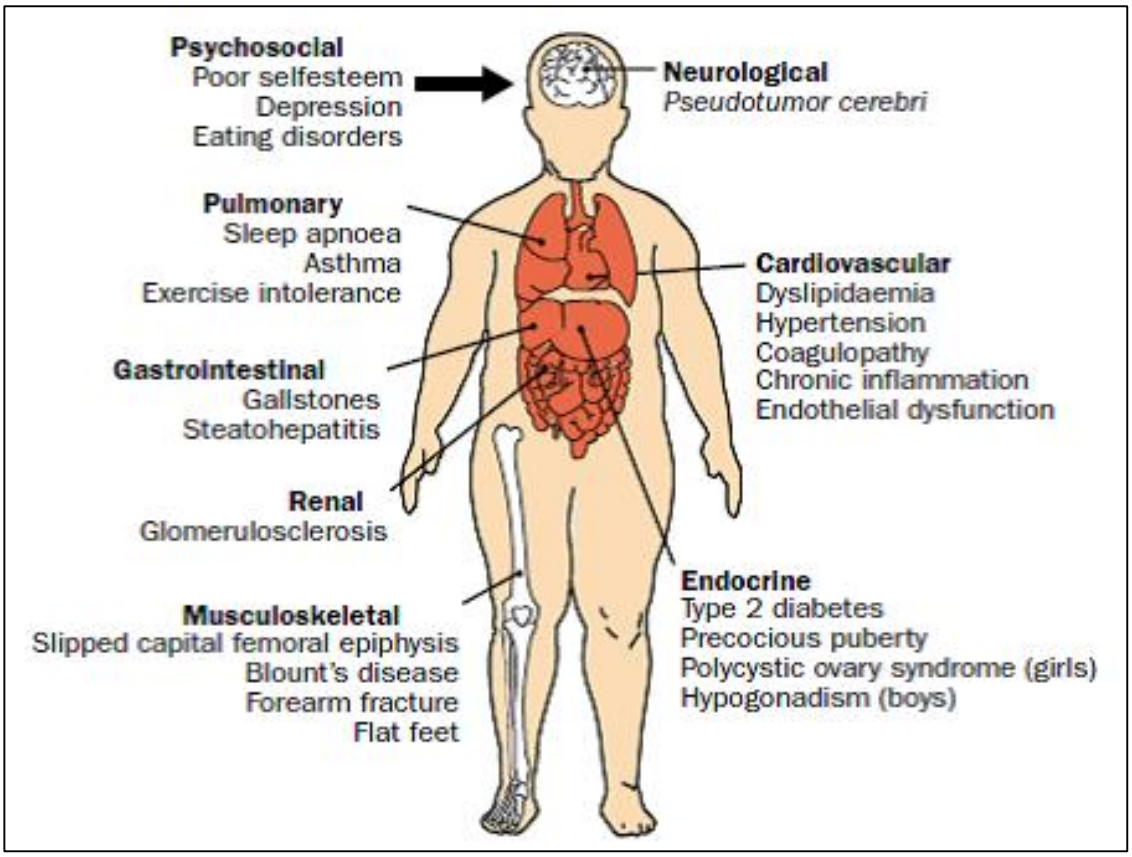

Figure 2.2: Complications of childhood obesity
(Source: (Ebbeling et al. 2002))

Obesity in children is a risk factor for psychological ill health, CVD, asthma, chronic inflammation, diabetes types 1 and 2, orthopaedic abnormalities and liver disease (Hyponnen et al. 2000, Reilly et al. 2003, Reilly and Wilson 2007) (See figure 2.2). Estimates report that at least 60% of obese children are likely to remain obese into adulthood (Reilly and Wilson 2007) and therefore are at risk of hypertension, CVD, type 2 diabetes, other types of ill health and potentially premature death (Department of Health 2005) as adults. As obesity levels in children have continued to rise (unlike levels of overweightness which appear to have remained largely unchanged) (The Health and Social Care Information Centre 2013), action is required now to prevent and reverse this trend and the subsequent risks to health. It has been shown that good nutrition is a vital component of maintaining good health (Department of Health 2005) in conjunction with other healthful behaviours.

Research has established an association between a regular and increased consumption of particular nutrients and an increased risk for certain chronic diseases associated with obesity, such as hypertension, CVD and type 2 diabetes. These nutrients include saturated fats (Weichselbaum and Buttriss 2011), salt or sodium (Weinberger 2008), and simple sugars, particularly NMES (Weichselbaum and Buttriss 2011). This is particularly evident in the case of SSSD (Weinberger 2008) and other energy dense foods. A reduction in the consumption of foods containing high amounts of saturated fats, salt and sugars, has the potential to curtail the prevalence of obesity or overweightness in the population (Weinberger 2008). It is often the case that these are the nutrients given priority for knowledge education in school-based nutrition programmes or interventions (Contento et al. 2002) in conjunction with those aspects of diet that may have a desirable, positive impact (Baranowski 2011) such as fruits and vegetables.

2.3 Diet Quality

The concept of investigating the *quality* of a person's or a population's diet, is a relatively recent development in the field of dietary assessment (Marshall et al. 2012, Ocke 2013). Historically studies of the diet have been limited to measuring the intakes of single nutrients to give an indication of the risk to health, particularly for certain chronic diseases, as discussed earlier in this chapter. Marshall et al. (2012) (p.96) describes diet quality as '*a recent dietary concept that refers to both the nutritional adequacy of individual's dietary patterns, and how closely food patterns align with National Dietary Guidelines.*'

In the UK, this would refer to the Dietary Reference Values (DRV) issued by the Scientific Advisory Committee on Nutrition (SACN) (Department of Health 1991). Diet quality is deemed a more useful measure for the simple reason that people do not eat nutrients; they consume foods which are mixtures of these nutrients. This consumption often falls into patterns of eating and these patterns include 'meal' and 'between-meal' eating (Ocke 2013). These patterns are also influenced by individual preference for certain foods, income, food prices, environmental, cultural and social factors (Ocke 2013).

Another important factor in assessing diet quality, is how the nutrients in the foods being measured behave as part of the whole diet; some nutrients will act synergistically with each other whereas others work in opposition (Ocke 2013). For example, vitamin C enhances the absorption of non-haem iron when consumed at the same time (Mann and Truswell 2007). Phytates, however, found in wholemeal cereals in particular, can bind certain minerals, such as iron or calcium, and make them less available for absorption (Mann and Truswell 2007). Traditional dietary assessment of single nutrients does not consider these interactions. It is also potentially difficult to be specific about which aspects of the overall diet are contributing to obesity, and therefore which aspects of the diet should be targeted for action (Jennings et al. 2011). Those food groups which have been identified in previous studies as contributing to overweightness or obesity in children, are typically directed at (Rennie et al. 2005).

The measurement of diet quality in children however is more problematic, mainly due to their age-related ability to reliably recall their food and drink consumption for the previous 24 hour period (Goran 1997, Livingstone et al. 2004), and the association with their literacy levels.

Diet quality questionnaires have been developed to capture this type of data. The two most commonly used are the Diet Quality Index (Patterson et al. 1994), now revised (Diet Quality Index Revised [DQI-I]) (Haines et al. 1999), and the Healthy Eating Index (Kennedy et al. 1995). However, as with other methods of dietary analysis, there are limitations to the data that some of these questionnaires can collect. For example, the questionnaire needs to be population specific; a questionnaire designed for US populations (Diet Quality Index Revised) or Australian children (Dietary Guideline Index for Children and Adolescents) is potentially not going to be of use for UK children as the UK DRVs and dietary recommendations are different to the US and Australia (Florence et al. 2008). Additionally, more research is needed regarding ethnically diverse populations (Nicklas 2004). That said, one advantage of diet quality indices is that they can be scored quickly and are therefore less time consuming than other methods, as food and drink consumption only, is recorded (Marshall et al. 2012). This is useful in population-based studies.

These diet quality questionnaires typically capture aspects of the diet, which are governed by national guidelines for nutritional adequacy in the diet, such as intakes of grains, fruits and vegetables, total fat, saturated fat, and sodium (Dubois et al. 2008). The combinations of these nutrients within foods is scored, and depending on the nutrients of interest, the typical diets of the populations, and the frequency of consumption, a diet quality score or index is calculated.

In order to get an indication of the diet quality of the children in this study, a pilot study carried out by Johnson and Hackett (unpublished) was utilised. Following a validity study of the food intake questionnaire (Johnson et al. 1999), dietitians registered with the Health Professionals Council assessed the types of foods which should be eaten either 'more of' or 'less of' in the diet. The frequency of responses was recorded and these food items were then grouped into 'positive marker foods' and 'negative marker foods' and a score calculated to give an indication of diet quality. More detail on this is given in chapter 3, p.33.

2.4 Current trends in UK children's food intakes

The National Diet and Nutrition Survey (NDNS) assesses the diet, nutrient intake and nutritional status of people living in private households in the UK (Department of Health 2012) and gives an insight into how much of particular types of foods children in the UK are reportedly consuming. This is a rolling survey with the most recent data being published in December 2012 (Department of Health 2012). For those aspects of healthy eating associated with the CHANGE! teaching curriculum, important findings thus far for children in the U.K. in the age groups 4 to 10 years, and 11 to 18 years, included:

- Mean energy intakes for boys and girls were within the range recommended by the Estimated Average Requirements (EAR) for Energy (Department of Health 1991): 1555 kcal/day for children aged 4 to 10 years, and 1791 kcal/day for 11 to 18 years (recommendations are within the range of 1545-1970 kcal/day for children aged 4 to 10 years, and 1845-2755 kcal/day for

children aged 11 to 18 years; sex and age dependent) (Department of Health 1991).

- The mean saturated fat (SFA) intakes for the age groups 4 to 10 years, and for 11 to 18 years, exceeded the DRV of no more than 11% food energy from SFA: mean intakes were 13.3% and 12.6% respectively. However for *trans* fatty acids, mean intakes provided 0.7-0.8% of food energy; therefore meeting the DRV of no more than 2% of food energy.
- Children aged 11 to 18 years mean intakes of NMES were 15.3%, exceeding the DRV of providing no more than 11% of food energy. Children aged 4 to 10 years also exceeded this DRV, with a mean intake of 14.6% of total energy.
- Boys aged 11-18 years were on average consuming 3.0 portions of fruits and vegetables per day and girls aged 11-18 years 2.8 portions per day. 11% of boys and 8% of girls within this age group were reportedly meeting the 5-a-day recommendation.

  (Department of Health 2012).

These results, although preliminary at this time, demonstrate that children have intakes of SFA and NMES that exceed current UK recommendations, and that consumption of fruits and vegetables needs to be improved. In addition to these results, a recent report from the Institute for Fiscal Studies (IFS) (Griffith et al. 2013) has suggested that the increase in obesity in the UK is as a result of a more rapid decrease in activity levels than in the calories consumed by people, although the role of food in the obesity equation cannot and must not be ignored. This might explain to some degree the NDNS finding that children's energy intakes were within the EAR for their age groups. In order to achieve this at a population level, it has been demonstrated that healthy eating and physical activity interventions delivered to school-aged children, particularly at 6 to 12 years of age, and as part of the curriculum, may be the most promising environment to tackle some of these unhealthy eating habits (Waters et al. 2011).

Additionally, importance needs to be placed on the role of parents and the environment that they create for their children for the development of healthy eating behaviours and weight (Scaglioni et al. 2008). These are described as 'nutrition environments' by Glanz et al. (2005).

2.5 School-based, nutrition-focused interventions

The use of nutrition-based interventions to measure and determine healthy eating behaviours, is an established method for targeting particular populations, to inform them about how they might change or improve their eating habits and practices. Interventions aimed at the prevention of overweight and obesity in children and adolescents are considered to be a high priority (Lake et al. 2009, Waters et al. 2011), especially as meta-analyses of such studies of interventions of this type, have shown strong evidence to support a beneficial effect (Waters et al. 2011). Structured programmes with a combined intervention approach to diet and healthy eating, behaviour change and PA are deemed to be beneficial in both the short- and long-term (Nemet et al. 2005, Parizkova 2008). Those that developed and delivered the intervention with a 'local context' in places such as schools, were considered to be the most successful (World Health Organisation 2009). Indeed, schools have long been associated and recognised as appropriate settings in which to deliver such interventions, and to promote healthy lifestyles (Nathan et al. 2013, World Health Organisation 2009). Whilst some studies have identified factors that contribute to poor eating habits in school children, such as vending machines increasing consumption of SSSD (Nathan et al. 2013), local governments tend to focus on the school environment as a place in which to promote healthy eating to a wider audience. This is because they are able to target a majority of the school-age populace as this environment is where they spend high amounts of their time (Haerens et al. 2006) and are therefore, accessible in a controlled setting. The school environment is also attributed with having an influence on children's eating behaviours (Haerens et al. 2006) by modelling a healthy food culture (Dimbleby and Vincent 2013). Some programmes have also focused on specific areas of the diet such as increasing consumption of fruits and vegetables (Tak et al. 2010), for example, the 'Food Dudes' programme (Horne et al. 1995, Horne et al. 2004, Lowe and Horne 2009).

The WHO (2009) found that those interventions delivered in the school setting were most effective when they were intensive, focused on diet and/or PA and were multi-component. Such interventions also included:

- A curriculum on diet and/or PA taught by trained teachers.
- Had a supportive school environment and policies.

- A parental/family component.

(World Health Organisation 2009).

Some of the evidence however also indicates that there is limited success with this type of intervention, particularly if the intervention is 'complex' (Wall et al. 2009) and has too many components. The evidence also suggests only a moderate effect for those interventions that focused on one area of change, such as diet only or increasing PA only, and when the assessment was formative to take into consideration the needs of the school and cultural contexts (World Health Organisation 2009).

There has been a variety of nutrition-focused interventions developed and evaluated in the UK and worldwide, but this is especially so in the USA. Meta-analyses and systematic reviews, e.g. (Clarke et al. 2013, Gorely et al. 2009, Woolfe and Stockley 2005, World Health Organisation 2009) have compared and appraised the existing research literature and have tended to find that it has been difficult to evaluate what *has* had an effect and what *has not*, with the interventions in general, partly due to:

- the different populations being investigated, especially where age is a factor,
- the diverse methods of data collection used, and,
- the different approaches to analysing the data.

Additionally, the studies have generally either been aiming for a reduction in BMI (or some weight loss) or to improve aspects of a participant's diet such as increasing fruits and vegetables intakes, rather than focusing on lifestyle. Lifestyle improvements and modifications would include promotion of healthy eating and aiding behaviour change, and this is what CHANGE! aimed to facilitate.

Interventions introduced and evaluated in the UK, include projects such as 'Project Tomato' (Christian et al. 2011), 'Top Grub' (Lakshman et al. 2010), 'GreatFun2Run' (Gorely et al. 2009), and 'APPLES' (Sahota et al. 2001), amongst others. As discussed earlier (p.26) these interventions have had varying levels of success and are difficult to compare with one another, due to the wide variety

of populations and methods used by the respective research teams. For example, the participants in 'Top Grub' (Lakshman et al. 2010) and the 'SPEEDY' study (Van Sluijs et al. 2008) were aged 9 to 11 years and 9 to 10 years respectively. This is compared to the 'APPLES' programme (Sahota et al. 2001) where the children were aged 7 to 11 years and 'Food Dudes' (Horne et al. 1995) where they were aged 4 to 11 years old. The educational needs and abilities of the children across all these age groups vary widely and therefore make it difficult to adeptly compare them.

Additionally, where anthropometric measurements were taken and converted to BMI statuses, the International Obesity Task Force (IOTF) cut-offs (Cole et al. 2000), and the British 1990 Growth Charts (UK 1990 BMI reference standards) (National Obesity Observatory 2011) were used to give an indication of baseline BMI statuses and to identify any post-intervention changes to BMI. It has been proven that estimates of overweight and obesity differ significantly across the different classification systems (Gonzalez-Casanova et al. 2013), so the prevalence of overweight and obesity will differ across the different studies.

Across the different interventions already mentioned, there was some commonality in the primary outcome measures. These included BMI status measurement, consumption of fruits and vegetables, and nutrition and food knowledge. In those studies which obtained anthropometric measurements, such as APPLES, Be Smart (Warren et al. 2003), and CHOPPS (James et al. 2004), no changes to BMI at post-intervention were found. GreatFun2Run however discovered that their intervention group had significantly lower rates of increase in BMI per year of age, after the intervention period, than the control group (Gorely et al. 2009).

In those studies which recorded fruits and vegetables consumption, intakes were generally reportedly increased during the intervention period. Some studies such as the 'Five A Day the Bash Street Way,' (Anderson et al. 2005) reported a significant increase in fruit consumption in the intervention group ($p=0.042$) and others reported a significant increase in vegetable consumption ($p<0.001$) ('Food Dudes,' (Lowe et al. 2004). Other studies reported no change in consumption of

either fruits or vegetables, e.g. Project Tomato, (Christian et al. 2011) over the data collection period.

Most interventions reported improvements in the children's knowledge over the data collection periods, e.g. Be Smart ($p<0.01$) and Top Grub (significant increase in knowledge score for intervention schools, than the control schools; $p=0.042$). GreatFun2Run however reported no significant increase in nutrition knowledge between the intervention and the control schools ($p=0.067$) over the data collection period (Gorely et al. 2009).

Despite the differences to the methods and the results that are apparent in the interventions discussed above, it has also been demonstrated that there are several factors which are common to all interventions, whether they are multicomponent or specific in their area of change:

- Effectiveness
- Sustainability
- Parental involvement
- Novelty and fatigue
- Length of intervention
- Age of the intervention
- Child-centred approaches
- Engaging schools

(Woolfe and Stockley 2005).

Table 2.1 (page 30) describes how CHANGE! aimed to overcome some of the issues surrounding these themes:

Table 2.1: Some terms which are common to all interventions and how CHANGE! aimed to overcome them

Theme of interventions	Definition of term	CHANGE!
Effectiveness	Studies are subject to limitations. Choice of measurement tools, experimental design and evaluation are considered here.	Tools – valid and reliability-tested tools chosen, where possible. Experimental design – use of theoretical framework to underpin the study. Standard procedures used for analysis of qualitative and quantitative data.
Sustainability	Can the study be sustained in the school for a long time?	The teachers were consulted about the factors which would practically help them to carry out the teaching of the intervention, e.g. teaching resource containing all the material including worksheets and hand-outs, CD for use on a Smart board.
Parental involvement	Is considered at the formative stages and during data collection.	Parents were enlisted to help with the focus groups during the formative stages of the study. Homework tasks were included in the teaching resource, for the children to do at home with their parents/carers.
Novelty and fatigue	Initially the intervention might be considered novel but over time this might wear off and a decline in interest might occur.	The intervention teachers willingly used the teaching resource and giving us updates on its use, during the 20-week intervention period.
Length of intervention	Intervention needs to run for long enough for an effect to be measurable.	Intervention ran for 20 weeks with a follow-up data collection 7 weeks afterwards.
Age of the intervention	The intervention needs to be appropriate to the skills and abilities of the children who are taking part. It needs to be inclusive so that all children are able to take part.	Year 6 (10 to 11-years old) were chosen due to an increase in their ability to make informed healthy food choices and an increasing independence in their lives overall.
Child-centred approaches	The children taking part in the intervention are allowed to take part in formative research in order to have some influence over the material that is delivered to them.	The children were involved in focus groups during the formative stages of the study. They were asked about healthy eating, health in general, role models and goal setting.
Engaging schools	Sustainability is essential here, as is enlisting the support of the school gatekeepers so that access to staff taking part is efficient.	Those schools who agreed to take part following the formative part of the study (Phase 1) were enlisted to take part in the data collection year (Phase 2). By consulting the teachers at the outset about what factors would make delivery of the programme easier for them, including any paperwork required as part of the ethical approval of the study, was the key to a successful partnership with the school.

Use of the PRECEDE-PROCEED planning model, as described in chapter 1, aimed to assist in the inclusion of some of these factors in the CHANGE! programme. This framework was also useful to ensure that individuals could develop skills that could be utilised to understand and use information, such as the information found on food labels, to make more informed food choices. This could then help to promote and maintain good health, encompassing the definition of 'health literacy' and giving individuals a sense of self-efficacy.

2.6 Eating habits and behaviour

Parents and carers are responsible for shaping their children's eating behaviours by the types of food that they make accessible to them, their own eating styles, behaviour at mealtimes, and child-feeding practices (Scaglioni et al. 2008). Indeed it is thought that these differences in eating style could be part of a behavioural phenotype that mediates the genetically determined effects which increases the familial risk of obesity (Burke et al. 2001, Wardle et al. 2001). Studies into stringent parental control, however, on what and when their children eat, have also shown that it can enhance the preference for high-fat, energy dense foods, limit their acceptance of a variety of foods, and disrupt a child's regulation of energy intake by altering his or her responsiveness to internal cues of hunger and satiety (Scaglioni et al. 2008); potentially leading to an increase risk for the development of overweightness or obesity.

Children are increasingly vulnerable to societal and peer pressure during the transition from childhood to adulthood (McKinley et al. 2005). The progression from primary school to secondary school is a particularly significant transitional period in terms of changes to their eating habits (Hackett et al. 2002). As they reach adolescence, they are increasingly taking control of what and where they eat. This coincides with an increasing propensity to consume more of their total food intake outside the home (McKinley et al. 2005).

In addition to determining the capacity of children and their families to undertake healthful behaviours, it is necessary to recognise the positive health-related behaviours that they are already achieving and investigate the triggers for unhealthy behaviours. Many different eating style constructs have been

implicated in the aetiology of overweight and obesity (Wardle et al. 2001). It has been hypothesised that obese people are under-responsive to internal satiety cues and over-responsive to external food cues, and to eat too fast, thereby hindering the onset of satiety cues (Wardle et al. 2001).

2.7 Conclusion

This pilot study aimed to establish if the inclusion of a tailored, population-specific teaching intervention about healthy eating, into the school curriculum would have any impact on the eating behaviours and nutrition knowledge of children aged 10 to 11 years old in Wigan. This approach is novel in this area of the North West of England. This study also aimed to modulate nutritional behaviours generally, rather than focussing on only increasing consumption of fruits and vegetables, for example, or reducing SSSD consumption, as other studies have done. The intervention teaching curriculum and the data collection methods at baseline and post-intervention were devised with this in mind.

Chapter 3

Methods

3. Methods

3.1 Introduction

The methods used in this research needed to be suitable to engage with 10 and 11 year old children (year 6) and their families in a nutrition-based intervention. The methods also needed to be able to measure specific areas of nutritional interest including food intakes, knowledge about foods and healthy eating, and their attitudes to foods and eating, to determine any effect of the intervention. The methods chosen for this research were decided on using a whole research team approach.

Previous studies, as discussed in chapter 2 (p.26) have identified diet, and food and nutrition knowledge as important aspects to investigate. There have been various methods used in these studies to measure the aspects of nutrition under investigation and to determine outcomes. Studies such as The SPEEDY Study had a dietary assessment or food intake recall component to the study (Lowe et al. 2004, Sahota et al. 2001, Van Sluijs et al. 2008, Warren et al. 2003). Some studies concentrated on intakes of fruits and vegetables (Anderson et al. 2005, Christian et al. 2011, Gorely et al. 2009, Lowe et al. 2004). Additionally, some studies have also tried to measure food knowledge in children (Anderson et al. 2005, Lakshman et al. 2010, Warren et al. 2003). Most intervention studies were multi-component which means that they attempted to measure several dietary or food-related factors at the same data collection point or points. Some of the problems that can be encountered approaching research this way are discussed in chapter 1 (p.4-5).

For this study a validated and reliability-tested 24-hour recall method (Johnson et al. 1999) was selected, which recorded what types of foods the children had consumed in the 24-hours prior to participating in the data collection. This was the most appropriate method for measuring food intake for this study as it was the *types* of foods being consumed that was of interest. The study did not necessitate a quantitative measurement of energy intake or the intakes of particular nutrients. Additionally, due to funding restrictions, it would not have been possible to carry out the collection and analysis of weighed or estimated

food diaries for all participants over the three data collection points, in order to collect this type of data. Weighed or estimated food diaries, whether over 3, 4 or 7 days, also have a high participant burden (Wrieden et al. 2003) which would have impacted on the quality of the data obtained.

The children's attitudes to foods and eating were also considered a major source of interest, by the research team. Previous studies have shown that the origins of food choice for children and adolescents are embedded in their perceptions of the culture in which they live, their status, social belonging, identity and image (Fox and Ward 2008, Stead et al. 2011, Tivadar and Luthar 2005) and not just in what they liked or disliked. Not standing out from their peer group has also been shown to be an important influence for adolescents on attitudes to foods and eating habits (Wills 2005).

Therefore, the children's behaviours, experience and perceptions of food and nutrition were considered important research topics to be investigated. These were categorised as 'food intake', 'food knowledge', and 'attitudes' to food and eating:

- **Food intake**: to investigate the reported food intake of the children from the previous 24-hour period using the 24-hour recall method.

- **Food knowledge**: to investigate what knowledge and experience the children had regarding ingredients for particular foods, their self-reported self-efficacy at making certain foods, and some general knowledge questions about which foods should form part of a healthy lifestyle.

- **Eating attitudes**: to investigate the everyday habits and behaviours of the children with regards to food and eating.

3.1.1 Measuring Food Intake in Children

One of the most challenging aspects of human nutrition research, is the measurement of habitual food intake (Goran 1997). This is particularly true when attempting to determine the food intake of children, with a majority of studies

demonstrating errors within the children's recollections and therefore impacting on their reliability (Baxter et al. 2008, Baxter et al. 2003, Baxter et al. 2004). Research undertaken on the reliability of the recollection of the children, suggests that it relies heavily upon the co-operation and recollections of parents and guardians. Indeed, a further limitation of parental involvement is the possibility of recollection bias, their own failure to accurately recall the food intake, and lack of motivation to acceptably complete any paperwork (Goran 1997). For instance, Goran (1997) recognises the issue of recollection bias and failure to accurately recall food intake. Baranowski et al. (1991) found in their study, that preferred food may be recalled over non-preferred food which thus increases the likelihood of error (Baranowski et al. 1991).

There are several recognised, non-invasive methods used to measure nutrient and food intake in humans, at both an individual and a population level. The most notable include weighed or estimated food records, reported over a specified period of time (usually 3, 4 or 7 days), 24-hour recall, conducted either via interviews and/or questionnaires, food frequency questionnaires (FFQ), and household food surveys. Weighed or estimated food records generally require an individual to report all foods and drinks that they consume over the test period, and quantify the portion size of the food consumed, including reporting any leftovers. Portion size is particularly important if nutrient intakes are to be calculated from the foods recorded, and often photographic atlases (Nelson et al. 1997) and food portion size tables (Food Standards Agency 1988) are used. Such methods are quantitative or semi-quantitative, and can give an indication of dietary patterns (Magarey et al. 2009).

The FFQ method collects data about the frequency of consumption of a list of foods. It is normally self-administered and is therefore suitable for large scale surveys due to the low-respondent burden. No nutrient intakes however can be measured from it, (unless the semi-quantitative FFQ is used). The FFQ has some similarities to the 24-hour recall method, such as low-respondent burden, and suitability for large scale surveys. Both methods however are dependent upon accurate memory recall by the participants. The 24-hour recall method was chosen by the researchers (Johnson et al. 2001) due to familiarity with the

method and collection of this type of data, and that this particular tool had been used successfully for ten years in another study (Boddy et al. 2013, Johnson et al. 2001).

Household surveys are designed to monitor trends at the population level and have been used for large scale surveys of households in the U.K. such as the Living Costs and Food Survey (Office for National Statistics 2013). This method does not collect data at the individual level and was therefore not suitable for this study.

It is known that children are sufficiently developed at age 7 to 8 years old to have a perception of their own food intakes (Livingstone et al. 2004) but are still reliant to a large degree on parental assistance to do this. By the age of 12, the age at which they spend their first year at secondary school, their ability to recall and estimate food and portion sizes, is more developed. This has only been found however, to relate to food consumed within the previous 24-hour period (Livingstone et al. 2004). This change between the ages of 8 and 12 years in their ability to accurately report dietary intake, is seen as a 'transition' period in some studies (Burrows et al. 2010) and is an important factor when considering which age groups to target when developing interventions such as CHANGE! and when considering the types of data collection methods to be used.

Measurement of food intake using a 24-hour recall questionnaire

The 24-hour recall questionnaire was utilised in CHANGE! because of the need to collect a sufficiently large amount of food intake data, based around the *types* of foods that were being consumed, rather than a need to measure nutrient intakes or energy intakes (EI) of individuals. The 24-hour recall food intake questionnaire (FIQ) was based on the child's recall of foods consumed the previous day. Although having previously been used in a large scale survey reporting children's food intakes (Johnson et al. 2001, Johnson and Hackett 1997), the method is reliant upon accurate memory recall and is only a single observation of the types of foods that were reportedly consumed on a particular day. It therefore does not give an indication of 'habit' or 'typical' food intakes in individuals or a population, over a period of time, like the FFQ might. For this

study it was therefore considered as a ‘snapshot’ of the children’s habits, at one particular moment in time.

Diet Quality: Positive and Negative Marker Foods

The concept of ‘diet quality’ has previously been described and discussed in chapter 2 (p.22). In order to try and ascertain a measure of ‘diet quality’ using the FIQ, particular foods on the FIQ were categorised and validated according to whether they would normally be recommended to be eaten more often/more of in the diet (‘positive marker foods’) (PMF) or if they would normally be recommended to be eaten less often/less of in the diet (‘negative marker foods’) (NMF) (Johnson et al. 1999). Foods considered as PMF included high fibre and oat-based cereals, brown and wholemeal breads, fruits, vegetables (not fried), and water. Foods considered as NMF included biscuits covered in chocolate, sweets, sugar added to drinks or on foods, chips, crisps, and SSSD.

Misreporting in dietary intake assessment

Misreporting and particularly under-reporting is an issue related to dietary assessment. Doubly-labelled water is considered the gold standard reference method for validating EI measurements (Burrows et al. 2010) and has been used in research studies as a direct measure against what has been reported via the dietary assessment method employed, such as 24-hour recall, and what has actually been consumed. Studies in adults have shown under-reporting of EI with 24-hour recall methods to be in a range of 21.5% to 31% (median 27%) and to be associated with higher BMI in participants (Poslusna et al. 2009). Over-reporting of energy intakes by adult participants differed for males and females but was in a range of 1% to 6% (men 1.6% of over-reporters) (Poslusna et al. 2009).

In children, misreporting is more likely to take the form of under-reporting (Livingstone et al. 2004). Studies using doubly-labelled water as a control measure to assess the degree of variation between EI and weighed or estimated food diaries, and 24-hour recall, has estimated that variation to be between 12% and 20%; although it could potentially be higher (Livingstone et al. 2004). Using doubly labelled water in a population-based study or intervention however is not

practicable. Therefore an awareness of the level of under- or indeed over-reporting when collecting intake data via a 24-hour recall method for example, is crucial when assessing any amount of changes, significant or otherwise, to intakes.

In studies where quantitative nutrient data is collected, researchers can adjust their data to take account of misreporting, but it is more difficult to do when participants are answering 'yes' or 'no' to a question about having consumed a particular type of food in the previous 24 hours, as is the case with this study. It is therefore difficult to calculate or estimate the level of misreporting taking place, when used as a method on its own. This study acknowledged misreporting as a limitation of any dietary intake measurement study, as merely participating in such a study may bias a participant's reporting of their food intakes, due to their involvement (Burrows et al. 2010). Although the 24-hour recall method is a validated and reliability tested method, it records the food intakes of participants at one specific 24-hour 'moment in time' and therefore does not necessarily measure habit. This study reported the food intakes of the participants over three data collection points, to determine if there were any notable changes to intakes in the population over time (but not necessarily changes to 'habits'). Therefore, any statistical correlation that occurs must be treated with caution (Burrows et al., 2010) due to the evidence surrounding misreporting.

3.1.2 Food Knowledge

In 2010 a survey of adults (Food Standards Agency 2010) determined that foods and drinks high in fat and/or sugar, were most likely to be placed correctly on the Eatwell Plate (84% of respondents) whilst those foods categorised as sources of protein and those for starchy foods, were least likely to be placed correctly (35% and 36% respectively). In the same study, 'Attitudes and behaviours toward healthy eating and food safety: A scoping study' (Food Standards Agency 2010), older respondents (60+ years), men, respondents living in low income households (annual household income of up to £10,400), and non-White respondents were more associated with lower levels of knowledge and less likely to follow Government advice regarding healthy eating. When this measurement

of food knowledge is translated to children however, there is a dearth of reliable evidence available. What is known, is that even though interventions focus on trying to increase knowledge in children, there is little evidence that doing so improves dietary intake (Anderson et al. 2002). It has been suggested that this is due to the lack of appropriate tools to accurately measure the required behavioural outcomes (Parmenter and Wardle 1999).

The term 'nutrition literacy' has come into use in more recent times (Silk et al. 2008) (p.4) to describe '*the degree to which individuals can obtain, process, and understand the basic health (nutrition) information and services they need to make appropriate health (nutrition) decisions*.' Silk et al. (2008) assimilated the definition of nutrition literacy with health literacy. It is widely accepted that childhood is a critical time to instil knowledge of foods and some basic cookery skills in children in order to help establish healthy eating behaviours for adulthood. Schools are the ideal setting in which to do this (Clinch et al. 2009) and the National Curriculum utilised PSHE-C as the forum to teach nutrition education, at primary school level.

3.1.3 Eating Attitudes

With the burgeoning worldwide obesity crisis, and the seeming failings of public health messages about the benefits of healthy eating, scientists have begun to look at whether it is an individual's or a population's eating habits and behaviours that need to be addressed, rather than *what* it is they are actually consuming (Greenwood and Stanford 2008). Whilst disordered eating has been routinely researched in a clinical setting, everyday eating habits and behaviours have come under less scrutiny and been considered from a more psychological perspective, rather than a nutritional one. From a purely psychological perspective, what is referred to as 'emotional eating' and eating from a 'restrained' or 'unrestrained' perspective is also being extensively researched. The research into emotional eating centres on cognitive control (or lack of it) of their eating (Tomiyama et al. 2009) and is associated with anxiety or negative moods, with no strong association with hunger (Tomiyama et al. 2009). At a population level, however, the measurement of routine or habitual behaviours

were of more interest for this study, rather than the measurement of disordered or emotional eating behaviours.

To provide a starting point to the attitudes of the children to food and eating, their everyday 'routine' eating habits were investigated using the Eating Attitudes Questionnaire (EAQ). The definition of 'routine' in this instance describes their eating habits being shaped by environmental and cultural contexts (Gallimore and Lopez 2002). This definition could also include 'routines' reflecting the internalised thoughts, behaviours and tastes of people, and that they enact these factors over time, as a result of the social settings and cultures in which they live or have lived (Jastran et al. 2009).

Eating is a fundamental part of survival and maintenance of health and as a result, many food choice decisions are made on a daily basis. It has been estimated that most people make over 220 food decisions per day (Wansink and Sobal 2007). These choices can be seen as mundane or arbitrary, but may also have significant or symbolic rationale behind them (Sobal and Bisogni 2009). The availability of food in Western societies is ubiquitous and is accessible almost anywhere, at any time, by anyone. Some behaviours are associated with what, where, when, who, how much, and even whether to eat (Sobal and Bisogni 2009). They are therefore situational. Food choice can however also change over days, weeks and seasons (Jastran et al. 2009).

The aim of the EAQ was to determine if some of the posited behavioural influences were already present in 10 to 11 year old children. Using the work of Wansink (2009) and the themes that emerged from the qualitative data collected in Phase One of the CHANGE! study (Boddy et al. 2012) the researchers formulated a questionnaire that would aim to elicit and report some of these habitual behaviours of the children. These emerging themes and the resultant, final wording of the questions were:

- Rate of eating – e.g. 'I usually finish eating before everyone else.'
- Heritage/inheritance – e.g. 'I think it is important to eat everything on my plate at meals.'
- Portion size – e.g. 'I usually think that there's too much food on my plate.'

- Food neophobia – e.g. ‘I like trying foods that I haven’t eaten before.’
- Food cues – e.g. ‘If I see food, I want to eat it.’
- Convenience/accessibility – e.g. ‘I can help myself to any foods in the house I want.’
- Mindless eating – e.g. ‘When I’m eating, I’m often doing something else at the same time.’
- Food trade-offs – e.g. ‘I have to eat some foods I don’t like, so that I can have foods I enjoy, like pudding.’
- Food as a reward – e.g. ‘My favourite treat is a food.’

The EAQ Framework (figure 3.1) summarises the different areas of food and eating behaviours that were being investigated using this questionnaire. For example, in the literature, questions 6 and 7 are assessing the ‘availability’ of food to the children, in the home (Wansink 2009).

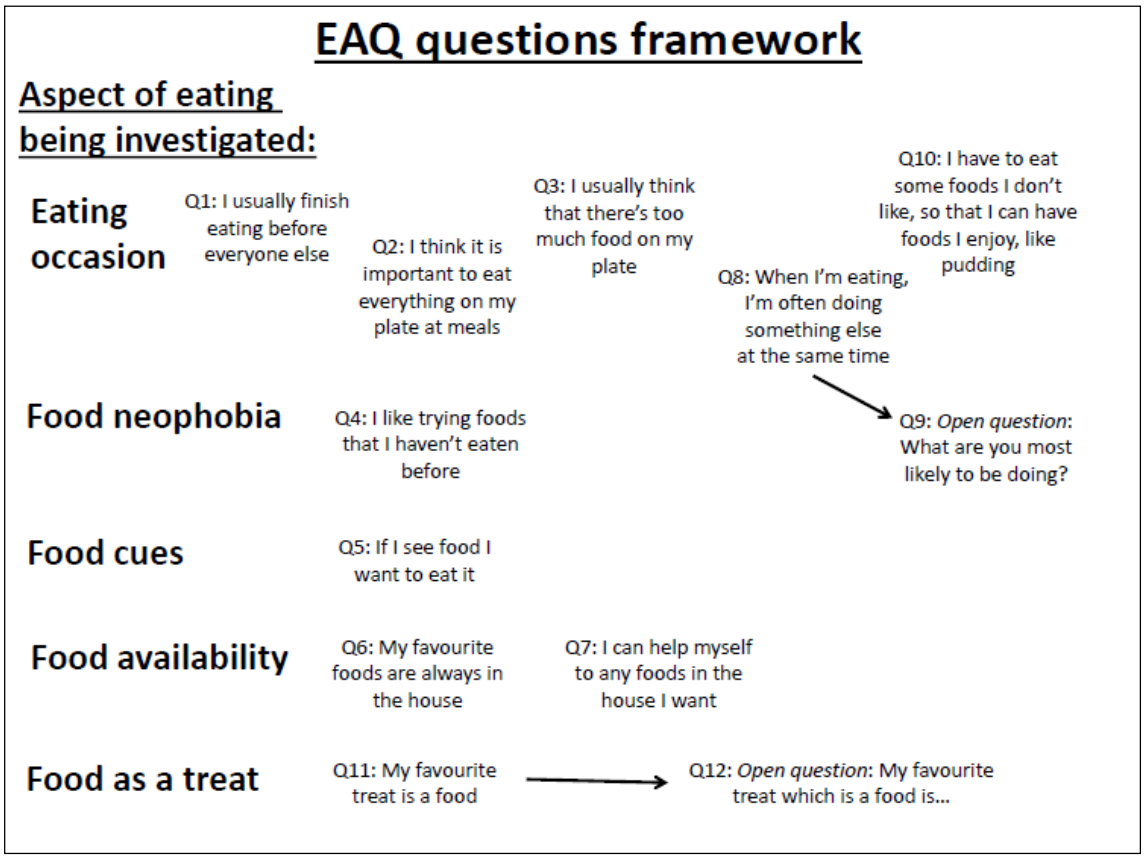

Figure 3.1: Summary of the aspects of eating being investigated by the EAQ

3.1.4. Measuring deprivation in Wigan

Wigan is recognised as a Spearhead area; an area of high deprivation and health inequalities (Wigan Council 2012). The primary schools who agreed to take part in the study were clustered within pre-defined geographical areas known as Neighbourhood Management Areas (NMA). To determine a measure of socio-economic status (SES) at school level, the percentage of students per school who were eligible to receive free school meals (FSM) was used. This is because eligibility for FSM is associated with financial and social circumstances: for example, receipt of Income Support, or Income-based Job Seeker's Allowance (GOV.UK 2013, Styles 2008). To ensure that the differing geographical and social settings were represented within the study, one high and one low SES school per NMA were randomly selected to take part.

As well as FSM being used as a measurement of assessment of the SES of a population, 'Indices of Multiple Deprivation' (IMD), measures from the UK Government, are also used to try to measure the level of deprivation within a community, city or local authority, for example. These indices are designed to measure 'deprivation' as opposed to 'poverty' (Department for Communities and Local Government 2011c) in small areas of England. Poverty is described as '*not having enough money to get by on*' whereas deprivation is a broader description to cover a lack of non-financial provisions such as health, education and access to services such as hospitals (Department for Communities and Local Government 2011a, Department for Communities and Local Government 2011c)

IMD is constructed using a system of measures in seven domains, which each reflect an area of deprivation (Department for Communities and Local Government 2011a, Department for Communities and Local Government 2011c). The domains used in the most recent IMD survey are:

- Income
- Employment
- Health
- Education
- Crime
- Access to services

- Living environment

(Department for Communities and Local Government 2011c).

The area with the least multiply deprived in the country will have a score of 1 (Department for Communities and Local Government 2011c). This means that the proportion of people living in that area are less deprived than in other areas, and this gives an indication of the circumstances and lifestyles of the people living there (Department for Communities and Local Government 2011c). It does not necessarily mean that the area itself is free from deprivation (Department for Communities and Local Government 2011c).

Previous studies have shown both a positive association between obesity and deprivation *and* obesity and affluence (Conrad and Capewell 2012), in small geographical areas, and also no association between deprivation and childhood obesity (Conrad and Capewell 2012, Dummer et al. 2005). Some studies have also reported an association between deprivation and childhood obesity, but no association with deprivation and childhood overweight (Conrad and Capewell 2012, Dummer et al. 2005). This indicates that any potential influences on prevalence of obesity and overweight, is particularly localised depending on the area and population under investigation. This suggests that interventions to raise awareness of overweight and obesity, and to provide information about how to make changes to lifestyles and to increase healthy eating behaviours, need to take the cultures and environment of the area of the population under investigation, into consideration.

The postcodes of the participants were therefore collected at baseline (BL), post-intervention (PI) and follow-up (FU) data collection points of the study, and converted into IMD scores to determine if some of these associations existed in our participants.

3.2 Assignment of Control or Intervention school status

On recruitment, the schools were randomly assigned as either an intervention (INT) school (n = 6) or control (CON) school (n = 5) using a random number

generator. This was done before commencing baseline measurements to allow intervention school teachers to receive training and familiarisation with the curriculum intervention teaching resource, 'A cross curricular approach for teaching Year 6 healthy eating and physical activity.' The study was registered with Current Controlled Trials (ISRCTN03863885).

3.2.1. Participants

In each participating school, all children within year 6 (10 to 11.9 years old) were invited to take part (n=420). Written informed parental consent and participant consent were received from 290 children (69% participation rate; Intervention n=138; Control n=152). Approximately 95% of the children were of white British ethnicity, which is representative of the school age population in Wigan (Wigan Council 2001).

3.3. Questionnaires used to measure food intake, food knowledge and attitudes to eating

Food intake, nutrition knowledge and attitudes to eating were measured by the use of self-completed questionnaires (see Appendix 9.7). Each child who had consented to take part was given one questionnaire booklet to complete, which contained the three individual nutrition questionnaires. The children completed the questionnaires in the classroom and they were able to ask the researchers any questions if there was something they did not understand. The participant children completed one questionnaire at each data collection point: baseline, post-intervention and follow-up.

3.3.1. Food intake questionnaire: 24-hour recall

A 24-hour recall questionnaire was used that had acceptable validity and reliability (Johnson and Hackett 1997), having been used previously in large scale studies with children of a similar age (Johnson et al. 2001). The questionnaire asked '*did you, at any time yesterday, eat any amount of*…' for 21 categories of foods, which equated to 59 individual types of foods. The children reported 'yes' or 'no' as to whether they had consumed foods such as fruits, vegetables, SSSD, and snack foods, on the day prior to completing the questionnaire (see Appendix 9.7 for details).

There was one question asking the children if they received a FSM, where they answered 'yes' or 'no.' Due to the confidential nature of this type of information, the accuracy of the children's responses were not further verified by the school. There were also two questions about the number of portions of fruits and vegetables the children may have eaten the day before, '*how many portions of fruit [or] vegetables did you eat yesterday*.' There were consecutively numbered options from zero (0) to nine-plus (9+) portions as answers.

Only the questions relating to food intake were utilised from the FIQ (Johnson et al. 1999) and the same format adopted for their presentation and completion (see Appendix 9.7).

Positive and negative marker foods

Following categorisation of certain foods as either PMF or NMF, because there were an uneven number of foods per category, intakes were converted to a percentage (%PMF, %NMF) so that they were comparable and any changes in habits with these types of foods could be determined.

From these percentages of PMF and NMF, a 'diet score' was calculated to give an indication of the overall diet quality of the participants reported intake.

3.3.2. Food knowledge questionnaire: 'Cooking Kids'

The 'Cooking Kids' questionnaire (Anderson et al. 2002) was used to collect data about the children's knowledge surrounding food preparation, cooking and nutrition knowledge. It was previously validated and reliability tested (Anderson et al. 2002). The questionnaire layout was reset from the original but the format, questions and wording all remained as per the original questionnaire (see Appendix 9.7 for details).

There were questions about ingredients and cooking times (e.g. '*what are the 3 main ingredients needed to make apple crumble?*' and how long they thought foods took to cook, such as boiled potatoes – '*up to 15 minutes/more than 15 minutes?*').

There were questions about their self-assessed ability to prepare certain food items, which asked if they could make a range of foods 'from beginning to end', such as boiled rice. This was answered by ticking a box to one of the following responses, '*all by myself/with a little help/with a lot of help/not at all*.'

For the nutrition knowledge questions the children had to choose one correct answer from a choice of 5 given answers (total: 7 questions; questions 7-13), five correct answers from a choice of 10 given answers (one question; question 14), and one correct photographic answer from a choice of 4 given photographic answers (one question; question 15). These included questions on recommendations from health experts and about the healthiest choices of foods.

3.3.3. Eating Attitudes Questionnaire (EAQ)

Development of the EAQ

The development of the EAQ began with a literature review of questionnaires generally associated with assessing and measuring eating behaviours in a human population. This search was then narrowed to those questionnaires associated with establishing and measuring eating behaviours in children. An important consideration was whether the children completed the questionnaires themselves in these studies.

The questionnaires found in this search, were aimed either at adults, such as the Dutch Eating Behaviour Questionnaire (van Strien et al. 1986); at eating disorders, such as the Children's Dutch Eating Behaviour Questionnaire (Van Strien and Oosterveld 2008); or required the parent or carer to complete the questionnaire on the child's behalf, such as the Parental Feeding Style Questionnaire (Wardle et al. 2001). This search identified that there was no suitable tool available to collect data about eating habits in children and which they could complete themselves. It was therefore necessary to design a questionnaire specifically for the CHANGE! project, that examined the everyday eating patterns and habits of the children and that a 10 to 11-year old child could self-complete.

This review led to a detailed exploration of Wansink's work (Wansink 2009), particularly on mindless eating. Despite most of his work relating to adults, the subject matter had great relevance to the area of interest; the domestic food culture. Fifty-one topics were identified as being of importance in the domestic setting, such as leftovers and eating with others. Through discussion with other researchers and members of the research team, and to make the questionnaire relevant for 10 to 11-year olds, ten of these topics were selected for further consideration. As the length of the questionnaire was an important consideration because of the ages of the potential participants, twelve questions were formulated.

These were peer reviewed by a psychologist, who specialised in food choice, two NHS dietitians, and a community food worker with extensive experience of working with children. Just one question required rewording following their feedback. Question 3 which initially read, '*At meal times I have the same size meal as the rest of my family*,' was considered ambiguous and reworded to read, '*I usually think that there's too much food on my plate*' to try to determine if the child felt they had a portion of food which was appropriate for them.
(See Appendix 9.7 for details).

Piloting of the EAQ - data collection periods

The EAQ was completed by the participants (n=290) at baseline, post-intervention, and follow-up. The EAQ formed section three of the trio of nutrition questionnaires they were asked to complete.

The completion of the questionnaires in the classroom was monitored by the research team and any feedback from the children was verbally noted and fed back to the nutrition research team. Nearly all the children completed the questionnaire with no comments. A couple of children (from different schools) however verbally queried the instructions with question 8:

8. When I'm eating, I'm often doing something else at the same time.

☐Never *(go to question 10)*

☐Not often *(go to question 10)*

☐Sometimes *(go to question 9)*

☐Almost always *(go to question 9)*

☐Always *(go to question 9)*

Depending on how the participant answered this question, they were then directed to either question 9 (if they had answered '*sometimes/almost always/always*') or to question 10 (if they had answered '*never/not often*') and a couple of children found these instructions confusing. For the future use of this questionnaire, it would potentially be necessary to amend these instructions.

Reliability

The EAQ was completed by the same 290 participants on three separate data collection points, over the research period. The EAQ was subjected to 'test, re-test reliability (also called 'stability reliability') and it is measured on the agreement of measurements over time. Stability is determined when the same participants use the same measure at a future date. The results from both data collection points are compared and correlated to give a measure of stability (Howell et al. 1994-2012).

Validity

Content validity of the questionnaire was assessed during the development of the EAQ by the involvement of other nutrition and health professionals (see '*Development of the EAQ',* p.47).

3.4. Anthropometrics

Anthropometric measurements of all participating children were taken using standard procedures. The children were measured without footwear and whilst wearing light clothing, as per the details below:

Height

This was measured using a portable stadiometer (Seca Limited, Birmingham, U.K.). The children were asked to stand upright against the stadiometer, and the distance between the top of the head and the floor was measured to within 0.1cm.

Body mass

The body mass of each child was measured using calibrated scales (Seca Limited, Birmingham, U.K.) to the nearest 0.1kg.

Body mass index

Their BMI status was calculated using the height and body mass measurements using the formula: BMI = body mass (kg)/[height (m)]^2. Weight status was classified as underweight, normal weight, overweight or obese according to the International Obesity Task Force cut-offs (Cole et al. 2000) (see table 3.1).

Table 3.1: IOTF BMI cut-off points and the equivalent adult BMI

IOTF BMI CUT-OFFS	Equivalent adult BMI (kg/m^2)
Grade 3 underweight	16
Grade 2 underweight	17
Grade 1 underweight	18.5
Normal weight	25
Overweight	30
Obese	35

3.5. IMD Score calculations

An indication of deprivation was calculated using the 2010 IMD. These were derived from the children's postcodes which were collected as part of the data collection process. GeoConvert (UK Data Service Census Support 2012-2013) was then used to locate the IMD scores from the given postcodes. These scores were then ranked and stratified into quartiles, labelled 1.00, 2.00, 3.00, and 4.00, with 1.00 as the least deprived and 4.00, the most deprived.

3.6. Data analysis

Each question was individually analysed using SPSS® 17.0 (SPSS Inc. Chicago, USA). Frequency tests, chi-square tests, independent samples t-tests and

ANOVA were used as appropriate, to determine any trends in the baseline and post-intervention data and to determine if there were any significant differences between the responses from the control or intervention groups, at baseline, at post-intervention, and between baseline and post-intervention. The corresponding p values are stated in the text where applicable. Significance was deemed to be $p<0.05$.

Chapter 4

A quantitative description of the baseline data

4. A quantitative description of the baseline data

4.1 Introduction

There is a surfeit of information available regarding what to eat, how much to eat, and how to incorporate healthy eating into a healthy lifestyle (Adamson and Benelam 2013). Even though life expectancy around the world has increased as a result of increased management and treatment of some communicable and non-communicable diseases (World Bank Group 2014), there is still a palpable risk from those diseases associated with lifestyle factors, such as CVD, cancer and type 2 diabetes; co-morbidities of obesity (Adamson and Benelam 2013, Department of Health 2005).

As previously discussed (chapter 2, p.24), 10 to 11-year old children's intakes of SFA and NMES were in excess of the recommended DRVs, and their intakes of fruits and vegetables below the recommended five-or-more portions per day (Department of Health 2012). As healthy eating is promoted as an important tactic to addressing the obesity epidemic (Atkins and Michie 2013), the incorporation of healthy eating into people's lifestyles, is of paramount importance. The factors which impact on adopting and making these changes have been discussed in more detail in chapter 1 (p.4) and chapter 2 (p.31). Fundamentally, these influences are multi-factorial and are shaped not just by the food preferences of the population under investigation, but the social, cultural, economic and political components which impact upon their lives (Adamson and Mathers 2004, Lean et al. 2007). The '*Foresight Tackling Obesities*' report (Butland et al. 2007) and '*Healthy Lives, Healthy People: A call to action on obesity in England*' (HM Goverment 2011) both recognised that the role of intervention, particularly at the community level, and the distinction between prevention and treatment of obesity, were key to changing unhealthy lifestyle behaviours. It was also acknowledged in the Foresight report (Butland et al. 2007) that behaviour is a complex but important factor to address. Thus a baseline data collection was undertaken for this study.

The baseline data collection phase of the study was necessary to measure the current habits and behaviours of the year 6 participants before any intervention

was introduced. The focus groups utilised in Phase One of the CHANGE! study investigated the eating behaviours, the role of food and eating in their lifestyles, and the environmental impacts on the participants and their families, as per Phase 3 of the PRECEDE-PROCEED model. The findings from this are reported in Boddy et al., (2012) (Appendix 9.8). The role of Phase Two was to determine the types of foods which the children were currently tending to consume, to establish their current knowledge levels about food and nutrition; and to ascertain any particular behaviours in their attitudes to eating. This data would then be compared to data collected at post-intervention (reported in chapter 5) to establish if there were any differences between the intervention and control groups and to potentially ascertain if the intervention teaching curriculum had had any impact on the intervention participants and their food choices, their level of knowledge or if it had altered their attitudes to eating.

This chapter therefore examines the baseline data prior to the intervention. Baseline data collection was completed in October 2010.

4.2 Aims of the study at baseline

The aim of measuring the children's food intakes, their knowledge of food and nutrition, and their attitudes to eating, at baseline and before the introduction of the teaching programme in the intervention schools, was to ensure that there was parity between the control and intervention schools. This would mean that at post-intervention any differences or changes between the control and intervention schools would be statistically discernible and any influence of the teaching curriculum could potentially be established.

4.3 Methods

For detailed methods, please refer to the 'Methods' chapter of the thesis (pp.33-51).

4.3.1. Subjects

Written informed parental consent and participant assent was received from 290 year 6 children (n=138 INT; n=152 CON). Their mean age was 10.64 years, with a minimum age of 9.11 years and a maximum of 11.32 years. Participation rate

was 69% from the schools that were approached and who agreed to take part in the study.

4.4 Results

4.4.1. Food Intake

Eating breakfast

Most children in both the control group (91%) and the intervention group (92%) had reportedly consumed breakfast on the previous day, at baseline. There was no significant difference between control and intervention at baseline (p=0.884) for reported breakfast eating.

Types of foods

There were no significant differences between control and intervention and their reported consumption of most foods, from the 24-hour recall questionnaire. Table 4.1 shows the frequencies of the reported intakes of both groups, including those foods that *did* report a significant difference (shown in red):

Table 4.1: Reported intakes of foods for control and intervention at baseline

	CON (%)	INT (%)	p value
Eat breakfast	90.7	91.9	0.884
Drink at breakfast	76.2	84.6	0.102
Eat on way to school	6.6	12.5	0.133
Drink on way to school	11.3	14.0	0.607
School dinner	47.7	55.1	0.252
Packed lunch*	69.5	55.1	**0.017***
Home for lunch	2.0	2.2	1.000
Sugar cereal	38.4	40.4	0.818
Fibre cereal	27.2	33.8	0.272
Oat cereal	6.0	13.3	0.54
Non-sugar cereal	18.0	23.5	0.314
White bread	65.6	69.9	0.516
Brown bread	25.8	36.0	0.081
Butter	58.9	58.7	1.000
Hard margarine	5.3	5.8	1.000
Soft margarine	9.3	16.7	0.089
PUFA margarine	19.2	24.6	0.330

Low fat margarine	6.6	12.5	0.133
Plain biscuits**	35.6	50.0	**0.019****
Chocolate biscuits	51.0	42.3	0.177
Cakes	28.2	33.6	0.391
Puddings	22.0	23.4	0.894
Sweets*	43.0	29.9	**0.029***
Chocolate	47.7	48.6	0.976
Ice cream**	18.5	31.9	**0.013****
Sugar in drinks	37.7	46.7	0.156
Sugar on foods**	21.2	32.1	**0.049****
Sweetener	10.0	7.4	0.561
Boiled potatoes	11.9	12.3	1.000
Mashed potatoes	20.5	29.7	0.096
Baked potatoes	8.6	13.0	0.305
Roast potatoes	15.2	21.0	0.261
Chips	47.0	40.6	0.326
Crisps	46.0	44.9	0.949
Fruit	67.3	74.4	0.242
Baked beans**	14.8	25.7	**0.030****
Salad	32.2	42.2	0.105
Fried vegetables	18.8.	17.2	0.841
	CON (%)	**INT (%)**	**p value**
Vegetables	48.0	51.9	0.596
Burgers	13.3	11.8	0.825
Sausages	18.0	20.9	0.641
Low fat burgers	4.7	6.6	0.646
Low fat sausages	4.0	7.4	0.330
Meat pies	17.4	20.6	0.600
Meats	59.7	60.6	0.978
Battered fish	5.4	10.3	0.182
Fish**	6.0	18.4	**0.002****
Cheese	29.3	32.4	0.671
Soft cheese**	10.0	19.9	**0.029****
Low fat cheese	8.7	11.8	0.502
Takeaways	24.7	21.5	0.620
Added salt	29.3	32.3	0.677
Fizzy drinks	39.3	45.6	0.342
Diet fizzy drinks	28.7	32.4	0.584
Cordial	66.2	62.5	0.593
Diet cordial	17.2	26.9	0.068
Full fat milk	18.5	17.9	1.000
Semi skimmed milk	57.3	61.8	0.521
Water	83.3	83.7	1.000
FSM**	16.8	28.1	**0.031****

* Control > Intervention, chi-square test, p≤0.029.
** Intervention > control, chi-square test, p≤0.049.

Significantly more of the control children reported having packed lunches at school (36.6% of all children) than intervention children (26.1% of all children), and more of the intervention children reported being eligible for FSM (13.4% of all children) than the control children (8.8% of all children) at baseline.

When the IMD score quartiles for the intervention group were compared to those for the control group for FSM, the intervention group contained more participants overall (n=38; CON n=25) (see table 4.2). Additionally, the control group proportionally contained more participants in the two lowest IMD score quartiles (areas of lower deprivation) than the intervention group. The intervention group had a majority (76%) of their participants in the two higher IMD score quartiles (areas of higher deprivation).

Table 4.2: Children reporting eligibility for FSM per IMD score quartile at baseline

IMD score quartile	CON (*f*)	% of FSM group	INT (*f*)	% of FSM group
1.0 least deprived (6.08-12.37)	5	20	1	3
2.0 (12.38-23.38)	3	12	8	21
3.0 (23.39-40.76)*	8	32	11	29
4.0 most deprived (40.77-66.33)	9	36	18	47
Total (n)	**25**	**100**	**38**	**100**

*Wigan, IMD score 26.00
*CHANGE!, all participants, mean IMD score 27.85

With the exception of baked beans and fish, all the other foods where there was a significant difference between control and intervention, were foods which would be recommended by a health professional to be eaten less of in a balanced diet. The intervention group reported to have eaten more of these types of foods in the previous 24-hours than the control group.

PMF and NMF

The control and intervention groups were compared to determine the frequencies of the reported consumption of %PMF and %NMF (See table 4.3).

Table 4.3: Frequency of consumption of PMF and NMF by control and intervention at baseline

		%PMF	%NMF
CON	Mean	5.49*	7.63
	SD±	2.64	3.63
INT	Mean	6.65*	8.14
	SD±	3.24	4.01

*(INT>CON, p=0.001)

This indicated that the mean frequency of reported consumption of those foods which were classed as NMF was higher than for PMF. The intervention group were reportedly consuming slightly more of the types of foods which were categorised as PMF. There was no significant difference between control and intervention for reported consumption of %NMF (p=0.260). There was however a significant difference between the groups for the reported consumption of %PMF (p=0.001). This indicates that the intervention group were reportedly consuming more PMF than the control group at baseline.

A 'diet score percentage' (diet score %) was calculated for each participant by subtracting the %NMF from the %PMF. Scores ranged from -54 (all/most foods NMF) to +58 (all/most foods PMF). The participants were separated into two groups:

- **Those participants with a score of -54 to -1:** classed as needing to considerably improve their diets or needing some improvement in their diets; described as 'lower quality diets.'
- **Those participants with a score of 0 to 58:** classed as needing some improvement in their diets or already consuming a healthier diet; described as 'better quality diets.'

The mean diet score percentage for all participants was -2.70%. The mean diet score percentage for the control group was lower at baseline than the intervention

group (CON -4.37%; INT -0.87%). This indicates a marginally lower quality diet for the control group. There was no significant difference between control and intervention (p=0.089) at baseline. The groups were acceptably balanced in terms of the percentage of participants split between the low quality diets and better quality diets scores:

Table 4.4: Diet score % splits for each group at baseline

	CON (% of total)	**INT (% of total)**
Lower quality diets, score -54 to -1	31.2	25.7
Better quality diets – score 0 to 58	21.2	21.9

Fruits and vegetables – 24-hour recall and number of portions

There was no significant difference between the control (p=0.242) and intervention (p=0.596) groups and their reported consumption of fruits and vegetables. Fruits were more popular than vegetables though, having a reported 71% of all children responding 'yes' to having consumed fruits in the previous 24-hours, compared to just 50% of all children responding 'yes' to vegetable consumption.

Data was collected for the number of portions of fruits and vegetables that the children had reportedly consumed. The children were asked '*how many portions of fruits did you eat yesterday?*' They were given a guide to what constitutes a 'portion' with the addition of '*about a handful e.g. 1 apple, 1 banana, a handful of strawberries'* for the fruits question. For the vegetables question, portion size was quantified by '*about a handful*' and any salad consumed was also included in this question. Potatoes were explicitly excluded, in line with Department of Health recommendations (NHS Choices 2011). A range of answers relating to the number of portions of fruits and vegetables were given, ranging from 0 to 9+ portions.

Almost a fifth of all participants stated that they had not consumed (zero portions) of either fruits *or* any vegetables the previous day (17.4% fruits, 16.4%

vegetables). Twenty-three participants (7.9%) stated that they had consumed no fruits *and* vegetables the previous day. Of this group, 13 were from the control group and 10 from the intervention group:

Table 4.5: Participants (n) who consumed no fruits and vegetables the previous day at baseline

		CON	INT	Total
Gender	Male	6	9	15
	Female	7	1	8
Total		13	10	**23**

Of all participants, 53% claimed to have consumed either 1, 2 or 3 portions of fruits and 61.2% of all participants claimed to have eaten 1, 2 or 3 portions of vegetables in the previous 24 hours.

When considering the UK recommendations of consuming five-or-more portions of fruits and vegetables per day, the following participants stated that they had consumed five or more portions of fruits and/or vegetables at baseline:

Table 4.6: Participants (n) who consumed five-or-more portions of fruits and vegetables the previous day at baseline

	CON	INT
Fruits only (>5, no veg)	3	1
Vegetables only (>5, no fruit)	0	0
Fruits & vegetables	69	72

For the control group, 45% reported consuming fruits and vegetables in the previous 24-hours. For the intervention group, this figure was slightly higher at 52%. Of those proportions, a very small proportion of each group reportedly only consumed five or more portions of fruit the previous day, with no participants reporting only consuming vegetables.

When the data was analysed by control and intervention group by the percentages within each group who reported that they had consumed fruits or vegetables the previous day, there was evidence of mis-reporting. For those participants in each group who had reported consuming fruits and vegetables,

there was a noticeable difference for those who reported consuming one or more portions of FV over the same reporting period (see table 4.7):

Table 4.7: Reported fruits and vegetables consumption for CON and INT groups at baseline

	CON (%)	INT (%)
FRUITS		
'YES'	67.3	74.4
'0' portions reported	20.5	14.0
Therefore, 'YES' to 1 or more portions	79.5	86.0
Difference	**-12.2**	**-11.6**
VEGETABLES	**CON (%)**	**INT (%)**
'YES'	48.0	51.9
'0' portions reported	18.5	14.1
Therefore, 'YES' to 1 or more portions	81.5	85.9
Difference	**-33.5**	**-34.0**

4.4.2. Food Knowledge

Ingredients

When frequencies were calculated for the ingredients questions which compared all participants, to give an insight into overall knowledge, over half of the participants had no knowledge of any of the ingredients for coleslaw (54.7%) or lentil soup (62.4%) and almost a third of participants claimed to have no knowledge of any of the ingredients for bread or apple crumble (28.6% and 29.4% respectively).

Table 4.8: Participants who correctly identified some or all ingredients at baseline

	Number of ingredients correctly identified by participants (%)				
Ingredients	**0**	**1**	**2**	**3**	**4**
Coleslaw	54.7	20.2	21.6	3.5	n/a
Lentil soup	62.4	16.4	16.0	3.8	1.4
Bread	28.6	44.9	20.9	5.6	n/a
Apple crumble	29.4	40.5	20.4	6.9	2.8

This indicates a low-level of knowledge of ingredients for particular foods.

The scores for each ingredient were added together to give a total score for ingredients knowledge (out of 14) and the scores were compared for control and intervention. There was a significant difference between the groups and their mean scores for 'total ingredients' (CON 3.92; INT 3.18; p=0.018). The control group scored a marginally higher mean total score than the intervention group.

Self-assessed ability rating

To self-assess their ability to make certain foods, the children had to select one statement for each type of food (n=9), and decide whether they could make those foods either '*all by myself*,' '*with a little help*,' '*with a lot of help*,' or '*not at all.*' The scores for each participant were added together to give a total score of self-assessed ability. The scores ranged from zero (0) (e.g. the participant did not think that they were able to make any of the foods at all) through to a maximum score of 27 (e.g. a high level of belief that they were able to make all of the foods listed, '*all by myself*').

Approximately a third to just over a third of participants reported that they would be able to make all foods on the self-efficacy list, from beginning to end, '*with a little bit of help*.' For making particular foods '*all by myself*', their self-assessed levels of self-efficacy were quite low, especially with the stir-fry, coleslaw and lentil soup food options.

Table 4.9: Frequency of self-assessed ability for all participants at baseline

	All by myself (%)	With a little help (%)	With a lot of help (%)	Not at all (%)
Stir-fry	5.9	43.1	22.6	28.5
Coleslaw	15.3	28.6	23.0	33.1
Boiled potatoes	28.4	33.6	21.8	16.3
Lentil soup	8.7	33.7	22.2	35.4
Apple crumble	15.3	39.6	24.7	20.5
Boiled rice	31.7	34.8	15.7	17.8
Pasta shells	31.8	30.8	15.9	21.5
Bread	28.8	33.3	18.2	19.6
Broccoli	34.1	31.7	12.9	21.3

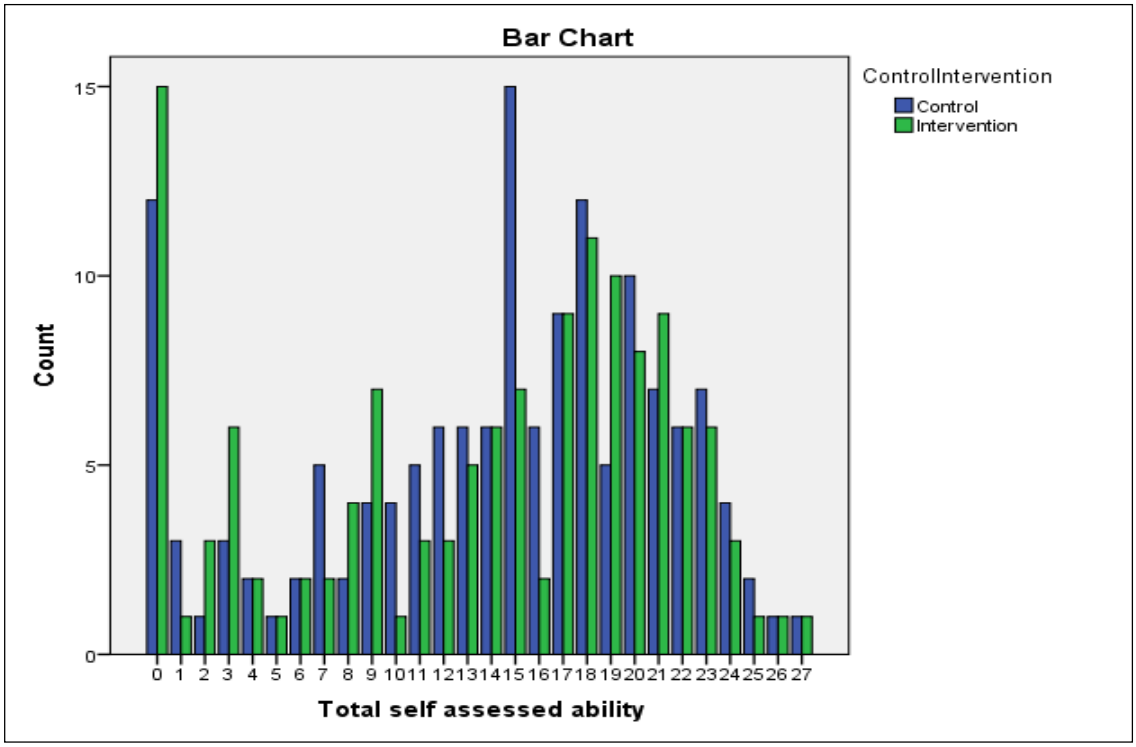

Figure 4.1: Frequencies of total scores for control and intervention self-assessed ability at baseline

There was no significant difference between control and intervention groups at baseline for the total score for self-assessed ability (mean scores: CON 14.14 ±7.12; INT 13.59 ±7.72; p=0.927).

Nutrition Knowledge

There were nine questions in total with a possible total score of 13 available. There was one correct answer per question for eight questions and one question where there were five possible correct answers. One participant scored zero (0) (0.4%) and two participants (0.7%) scored the maximum score of 13, with all answers correct. Over half of the participants (56.6%) scored between 7 and 10 correct answers, with all participants scoring a mean total score of 7 (7.92) correct answers.

There was no significant difference between the control and intervention groups for the correct number of answers (mean scores: CON 8.11 ±2.32; INT 7.70 ±2.60; p=0.142).

Question 15, which referred to the Eatwell Plate and is taught in schools as part of PSHE-C, had just over 75% of all respondents (CON 75.0% of respondents; INT 75.5% of respondents) giving a correct answer at baseline. There was no significant difference between the control and intervention groups for the number of correct answers to this question (p=0.846).

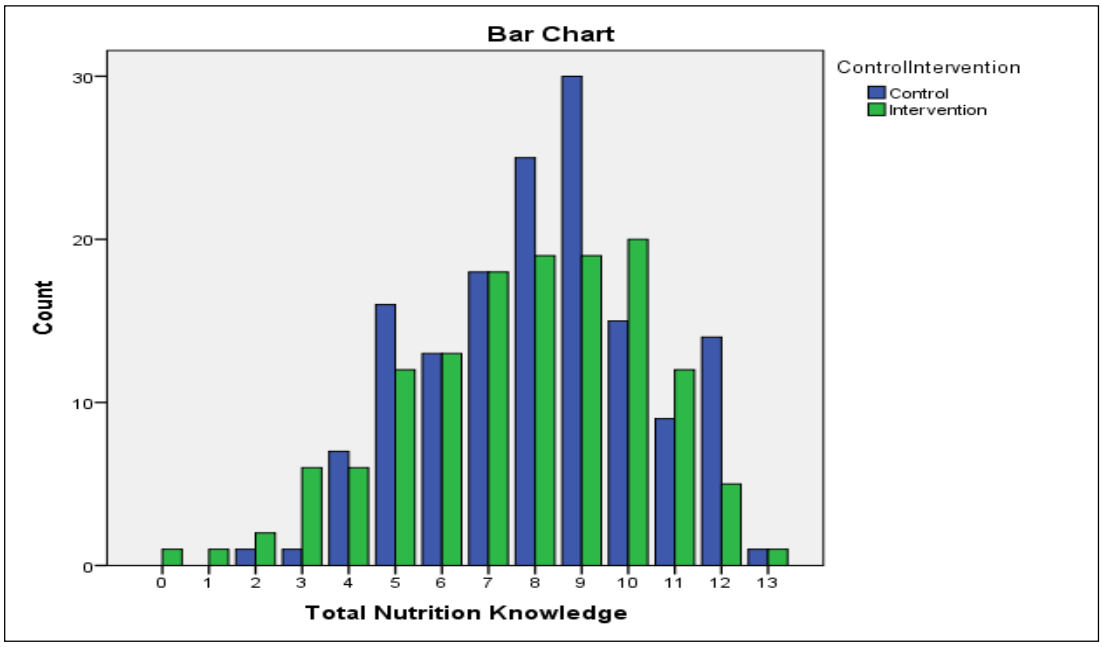

Figure 4.2: Frequencies of total scores for nutrition knowledge for control and intervention at baseline

Total Food Knowledge Score

When an overall score for the food knowledge questionnaire was calculated, there was no significant differences in the scores between the control and intervention groups (p=0.368). The total possible score for Food Knowledge was 59. The standard deviation (SD) for each mean score does however indicate that the scores for each group, varied widely from the mean within each group:

Table 4.10: Mean scores for control and intervention groups for total food knowledge at baseline

	CON	INT
Mean	29.26	27.14
SD ±	9.57	9.79

4.4.3. Eating Attitudes

Each question was considered on an individual basis, as each question was investigating a different aspect of eating behaviour and attitudes. An overall score from the EAQ, was therefore not calculated.

Questions 1, 2, 3, 8, 9, and 10 were associated with the eating occasion. Question 2 demonstrated that most of the children thought it '*important*' or '*a little important*' to eat everything on their plates at mealtimes (81.3%). There was also a significant difference between control and intervention groups for this question (p=0.040) with more of the intervention group thinking that it was '*important*' or '*a little important*' to eat everything on their plates.

For question 3, over half of the participants (53.8%) agreed with the statement that there was '*just the right amount of food*' on the plate for them at mealtimes, with 37.5% thinking that there was '*sometimes too much*' or '*always too much*' food on their plates. Thus, very few thought that there was not enough food on their plates (question 3, 8.7%). There were no significant differences between the responses of control and intervention for this question (p=0.822).

Question 1 was investigating if the children were aware of how fast they were eating their meals; referred to as 'speed of eating' in the literature (Wansink 2009). Almost half (44.9%) of all the participants said that they '*sometimes*' finished before everyone else when they were eating. A larger proportion of children (39.0%) reported that they '*not often*' or '*never*' finished before everyone else compared to those who reported '*almost always*' or '*always*' (16.0%). There was no significant difference between control and intervention for this question (p=0.562).

Question 10 – '*I have to eat some foods I don't like, so that I can have foods I enjoy, like pudding*' - aimed to determine whether the children had to adhere to any rules during the eating occasion. This question was related to question 2 about the importance of eating everything on their plates. There was no significant difference between the groups (p=0.586) with a majority of both groups reporting they '*sometimes*' (CON 23.7%; INT 19.5%) or '*not often*' (CON 12.2%;

INT 10.1%) had to eat everything on their plates so that they could have more enjoyable foods. This also indicates that foods that the children might consider 'treats' or 'rewards', such as sweets or desserts, are not being used by the 'food gatekeeper' in the household as an incentive to consume other foods which are not so well-liked by children, such as vegetables.

When the children were asked if their favourite treat was a food (question 11), there was a significant difference between groups (p=0.014). The intervention children '*agree*[d] *a lot*' that food was their favourite treat (13.9%; CON 8.7%) whereas more of the control children (11.8%, INT 4.9%) '*disagree*[d] *slightly*' that their favourite treat was a food. The children were also asked what their favourite foods were. These foods were then categorised according to an arbitrary measure, such as the potential for the food to be consumed outside of the home (e.g. takeaway foods, junk foods), or as 'savoury' foods, 'sweet foods', or those foods which are important in a healthy diet, such as 'fruits' and 'vegetables.' Those meals classed as 'home cooked foods' referred to those foods which were most likely to have been consumed at home, whether homemade or bought pre-prepared, such as spaghetti Bolognese and chicken pie.

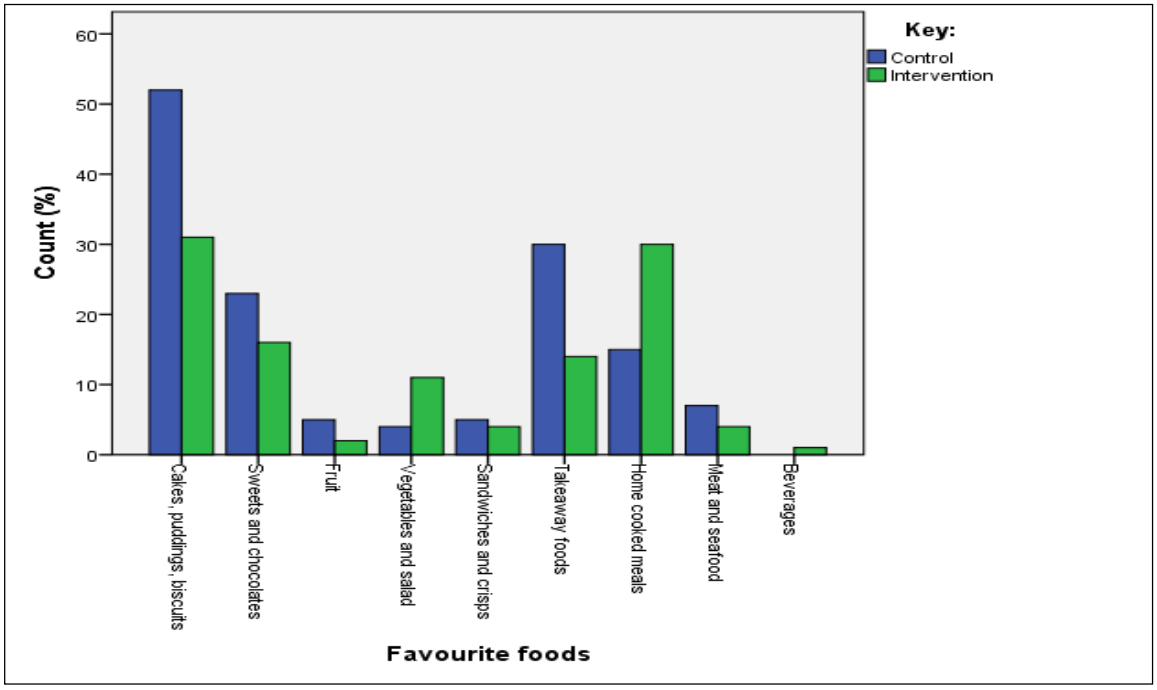

Figure 4.3: Reported favourite foods of the control and intervention children at baseline

A third of the children (32.7%), both control and intervention, listed 'cakes, puddings and biscuits' as their favourite treat. This included foods such as pancakes, ice-cream, apple crumble and custard, and yogurts. The next favourite group was 'home cooked meals' (17.7%) followed closely by 'takeaway meals' (17.3%). Those groups with the lowest numbers of preferences were 'fruit' (2.8%) and 'beverages' (n=1; 0.4%) where 'Coca-Cola' was stated as a favourite food.

It was more *unlikely* that most of the children would be doing something at the same time as eating (question 8); 27.1% said that they '*never*' do something else whilst eating and 59.5% said '*not often*' or '*sometimes*'. There was, however, a significant difference between groups for this question (p=0.006) with significantly more of the intervention children (15.8%) '*never*' doing something else whilst eating than the control children (11.3%).

When asked what types of activities they would be doing (question 9), if they were doing something, 18.6% said that they would be watching television or doing some physically active-type activity such as doing chores or playing outside (10.6%).

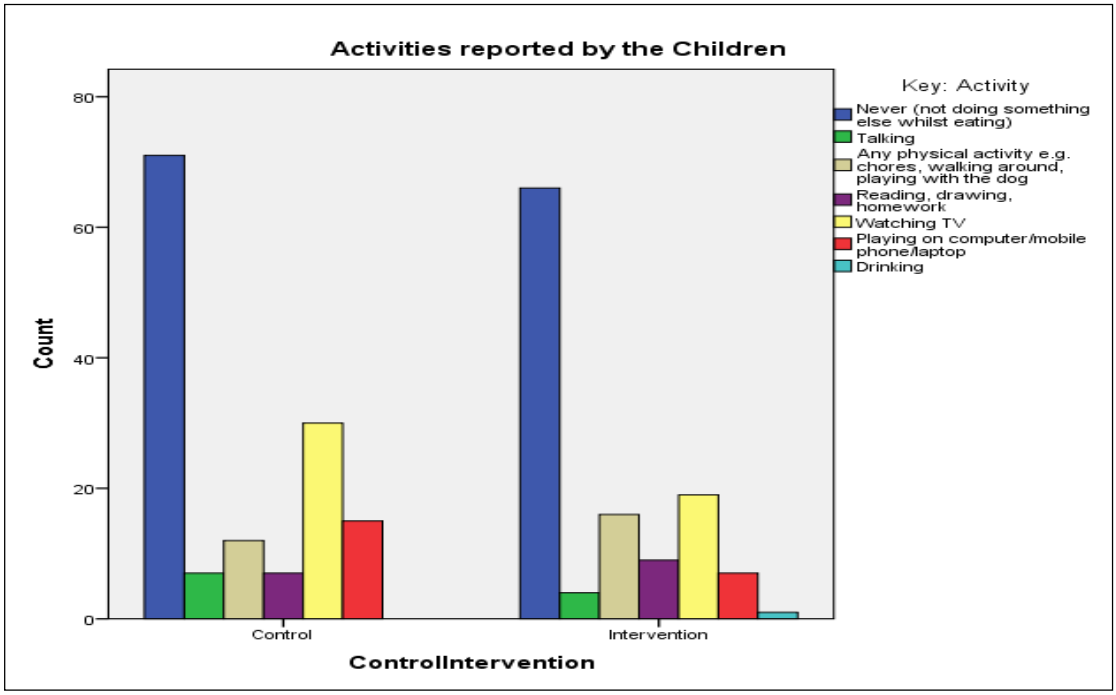

Figure 4.4: Activities that the participants were most likely to be doing if they were doing something else whilst eating at baseline

Question 5 asked the participants about their cues to food: '*if I see food I want to eat it*.' Almost half of the participants (47.7%) said that this was '*sometimes*' the case and 29.3% said '*never*' or '*not often*', which suggests that the children did not respond to 'seeing food' as a cue to eating or do not consciously acknowledge that they do. A fifth of respondents however said that they would be likely to want to eat food if they saw it (22.9%). There was no significant difference between control and intervention (p=0.297).

Question 4 was designed to assess levels of food neophobia: 'an avoidance and a reluctance to taste unfamiliar foods' (Mustonen et al. 2012) and to see how open the children were to trying new foods. The largest percentage of participants said that they '*sometimes*' liked trying new foods (39.2%) and 36.8% said that they '*almost always*' or '*always*' liked trying new foods too. There was no significant difference between groups for this question (p=0.606).

Food availability was addressed in questions 6 and 7. Over two-thirds of participants (69.1%) said that their favourite foods were '*sometimes*' or '*not very often*' available at home and 79.4% of participants only '*sometimes*', '*not often*' or '*never*' were allowed to help themselves to any food in the house. There were no significant differences between groups for either question 6 or 7 (p=0.617 and p=0.091 respectively).

4.4.4. Anthropometrics

The children's height (m), body mass (kg), waist circumference (m), and hip circumference (m) were measured and recorded. Their BMIs were calculated and classified according to the IOTF cut-offs (Cole et al. 2000). The results showed that a majority of the control and intervention children were of normal weight for height (31.9% and 34.4% respectively, 66.3% total) at baseline. There was no significant difference between the groups for any of the IOTF classifications of BMI (p=0.262).

Table 4.11: Mean heights and body masses of control and intervention children at baseline

		CON	INT
HEIGHT (m)	Mean	1.45*	1.41*
	SD ±	0.07	0.07
BODY MASS (kg)	Mean	38.26	36.39
	SD ±	9.79	7.84

There was a significant difference between control and intervention at baseline with their heights (p=0.000) with the control group being taller, on average than the intervention group. There were no significant differences with their body masses (p=0.073).

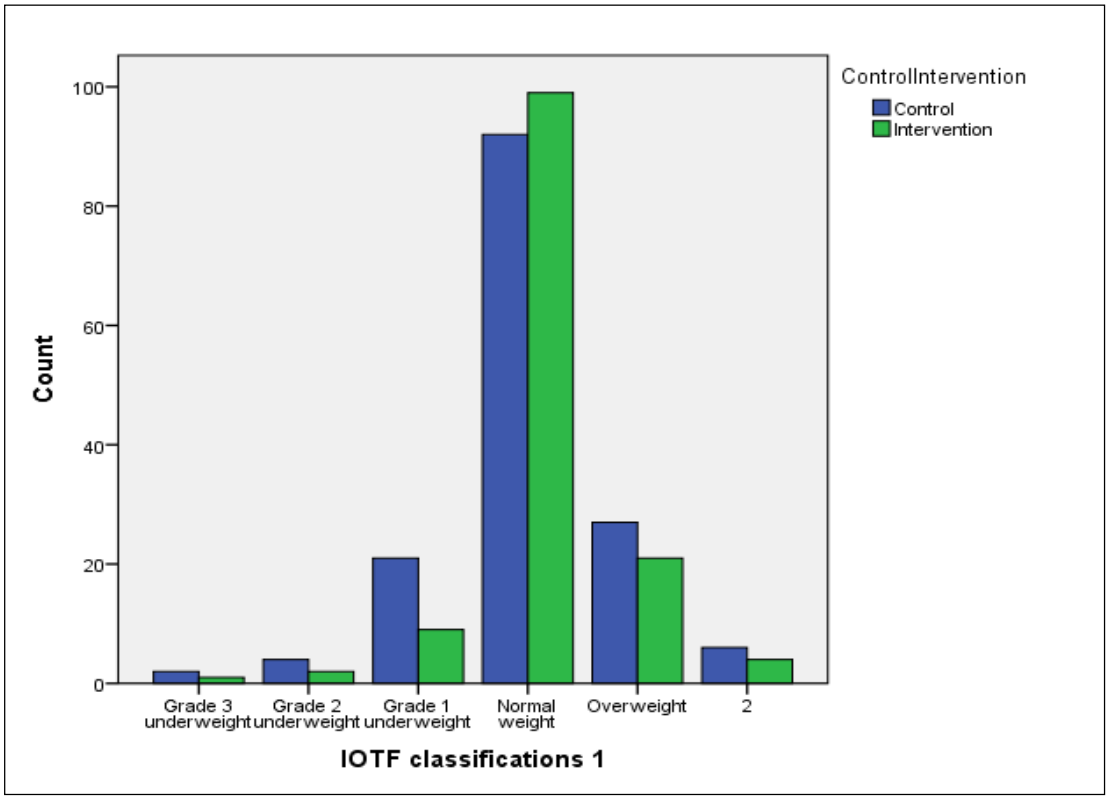

Figure 4.5: IOTF classifications of control and intervention children at baseline

The percentage of overweight children was 20.2% which is slightly higher than the reported England (19.0%), North West (19.7%) and Wigan (19.3%) prevalence, as reported from the National Child Measurement Programme (NCMP) (Office for National Statistics 2012) for year 6 children for the same school year.

The prevalence of underweight amongst the CHANGE! participants, was higher than the reported data for NCMP. CHANGE! reported 13.5% underweight (Grade 1, 2, and 3) whilst NCMP reported between 1.1 and 1.3% underweight (Office for National Statistics 2012).

4.4.5. SES and IMD data

There was wide variation in the SES and IMD data at baseline. Despite the schools being nominated either a 'low SES' status or a 'high SES' status according to the percentage of children eligible for FSM, when the IMD data was reviewed according to each child's postcode, the mean score for all children was 27.85 which is marginally worse than the reported average score of 26.01 for Wigan (Office for National Statistics 2011). There was however a wide range of scores from a minimum score of 6.08, which indicates a lower level of deprivation, to a maximum score of 66.33, which indicates a higher level of deprivation amongst the participants. This data confirms that CHANGE! recruited across all populations in the Wigan area.

The IMD scores were recoded into quartiles and the intervention schools had significantly more children living in areas of high deprivation than the control schools ($p=0.003$). However there was no relationship between IMD score and prevalence of overweight and obesity ($p=0.447$).

When intakes of fruits and vegetables were analysed, there were no significant differences between the different IMD quartiles and reported intakes of fruits ($p=0.327$) at baseline. There were, however, significant differences between the different IMD quartiles and reported intakes of vegetables at baseline ($p=0.021$). The children from the areas of lowest deprivation were most likely to have reported consuming vegetables at baseline (16.5%).

When total Food Knowledge scores were compared to IMD there was a significant difference between the mean scores of the children in the lowest quartile (score = 30.41) and the children in the highest quartile (score = 25.38) ($p=0.024$). This indicates that the children from the areas of lower deprivation had the highest average score from the Food Knowledge questionnaire.

4.5. Discussion

The aim of the baseline study was to describe the CHANGE! participants in terms of their food intake, their food and nutrition knowledge, their attitudes to eating and their habits, their BMI status and explore how the range of deprivation present in Wigan was represented. It was also to determine if there was parity between the control and intervention groups before the commencing of the teaching intervention in the intervention schools. The findings suggest that there is equivalence in most areas for the participants' food intakes, knowledge of foods and attitudes to eating and habits, and that all socio-economic groups are represented.

Food intake

Where there were foods with a significant difference between the control and intervention groups, four out of the nine items which displayed this difference were foods classed as 'sweet' or would be included as the types of foods which should only be eaten occasionally: biscuits, sweets, ice-cream, and sugar on foods. This data agrees with the qualitative data from the EAQ (question 12) which showed that the children's favourite foods were generally in the 'cakes, puddings and biscuits' category. Apart from the sweets, for the other three items (*plain biscuits, ice cream, sugar on foods*), the intervention group reported to have consumed them more often than the control group.

The other area where there was disparity between the control and intervention groups was with FSM and packed lunches, with the control group reportedly more likely to have consumed a packed lunch the previous day than the intervention group. Contrastingly, the intervention group were significantly more likely to report that they were eligible for a FSM than the control group. The percentage of FSM relates to those children in a school who are eligible for FSM due to a government assessment of family income and/or financial disadvantage (GOV.UK 2013, Hobbs and Vignoles 2010, Kounali et al. 2008) and has been used as a proxy for SES. Proportionally, the control group were most likely to be eligible for FSM than the intervention group (see table 4.2). This suggests that potentially those control children, who were eligible for FSM, were taking packed lunches to school rather than taking advantage of the eligibility for FSM.

The reasons for this from this data are unclear but potentially because the data was self-reported by the children, their true eligibility for FSM may or may not have been known at the time the data was collected and is therefore theoretically unreliable.

There were significant differences between the control and intervention groups when the PMF and NMF were compared. The intervention group reportedly consumed more PMF than the control group at baseline. This difference was also seen when the numbers of foods in each category were converted to percentages (%PMF, %NMF). The intervention group were consuming between one and two more PMF than the control group at baseline. This may be significant enough to suggest that the qualities of the diets of the intervention group were slightly better than those of the control group. This is in contrast to the findings for the intakes of each of the foods on the food intake questionnaire, where the intervention group reported significantly more intakes of biscuits, ice cream and sugar on foods than the control group. This may have been offset by the additional findings that the intervention group reported significantly more intakes of some important PMF: baked beans and fish (not fried).

There were no significant differences between control and intervention when the qualities of the participants' diets were determined from the diet score percentage. When the food intake data is examined as a whole, this result is not unexpected as there are few perceptible changes to the intervention participants' dietary intakes reported elsewhere. Following the work of Boddy et al. (2013) who used the PMF and NMF categories on a similarly-aged cohort, calculating a diet score percentage from 24-hour recall food intake data has an acceptable validity and reliability. As they point out however, this type of questionnaire does not measure energy and therefore it is difficult to assess if any positive changes to the children's diets would have resulted in a reduction in energy expenditure. This may impact on the level of risk to the children of obesity (Boddy et al. 2013). Further research is needed to determine whether calculating a diet score from the FIQ produces valid and reliable results for all populations in studies of this type.

There was also some disparity over the reported consumption of fruits and vegetables by the children. Whilst the children's mean reported numbers of consumed portions of fruits and vegetables were consistent with published UK figures, of 3.1 portions per day for boys aged 11 to 18 years and 2.7 portions per day for girls in the same age group (Department of Health 2012), the percentage of children reporting 'yes' to fruits or vegetables consumption in the previous 24-hour period was inconsistent with the percentage of children who reported what numbers of portions of fruits and vegetables they had consumed, during the same reporting period. This inclination towards giving a socially desirable response or 'recall bias' which manifests itself in conscious or unconscious over-reporting of apparent consumption of fruits and vegetables has been demonstrated in previous studies, particularly where intakes were self-reported (Christian et al. 2013). This is in contrast to the conscious and unconscious under-reporting of energy intakes particularly from snack foods and those foods high in sugar (Livingstone et al. 2004). Due to the extent of the research available associating low fruits and vegetables intakes with an increased risk for chronic conditions and diseases such as CVD and cancer, how to reliably record the fruits and vegetables intakes from children is a continuing limitation in this type of study.

Food knowledge

The children displayed low-levels of knowledge regarding the ingredients needed to make particular foods (13.3% of all participants), which was similar to the findings of the questionnaire's authors (<20% able to recognise the ingredients for each food type) (Anderson et al. 2002). For '*bread*' and '*apple crumble*', 44.9% and 40.5% respectively could name one ingredient for each food type (which was '*flour*' and '*apples*'). Lentil soup caused some difficulty, with some children not actually knowing what lentils were, which was observed in each school as the children were completing the questionnaires. As the 'Cooking Kids' questionnaire was developed for use in the North East of England and was also piloted in Scotland, geographical differences in the types of foods that might be familiar to the participants were likely to be different, which may explain the lack of knowledge about lentil soup from children in the North West of England.

If this part of the study was to be repeated as part of a continuation of the CHANGE! programme, then it would be beneficial to either develop a similar questionnaire using foods that children in the North West of England were more familiar with, or preferably, to develop a questionnaire that covered the specific subject topics that were covered in CHANGE! to test for improvements to knowledge.

Statistically there was a difference between the control and intervention group for their mean total scores for ingredients, however at baseline the difference was 0.74 of a correct answer. This is not a whole number and suggests an unremarkable difference in scores and could therefore be considered an unpersuasive significant difference in knowledge at baseline.

The participants' level of self-assessed efficacy at preparing certain food items was varied. The children did however acknowledge that '*with a little help*' they perceived that they would be able to prepare the foods by themselves. This is similar to the finding by Anderson et al. (2002). The drawback with the food and nutrition part of the CHANGE! study was that there was no practical cooking element within the teaching intervention with which to test this and so any changes in responses post-intervention, would possibly be a change in perception rather than a change in actual skill levels.

For the nutrition knowledge part of the questionnaire, there were no significant differences between the control and intervention groups. Foods and eating as part of a healthy lifestyle was taught in schools as part of PSHE-C, so concepts such as 'five-a-day' and the Eatwell Plate were familiar constructs to most of the children. Apart from this part of the school curriculum it is difficult to ascertain where their knowledge about foods and healthy eating is acquired from without further investigation. Although it is possible to speculate that it is from their families and carers, their peers and the media, further research using mixed methods such as a specifically designed questionnaire and a qualitative study using focus groups, might help to ascertain this information.

The children from the areas of lowest deprivation in IMD score quartile 1.00, scored the higher mean mark (30.41) for total Food Knowledge and significantly higher than the children in IMD score quartile 4.00 (25.38). This suggests that deprivation, in this instance, could potentially impact upon a child's lack of knowledge about ingredients, lack of self-efficacy to make some foods or knowing about foods as part of a healthy diet. Further investigation into this is needed.

Eating Attitudes

Both groups had similar attitudes to eating at baseline, based on the answers given on the EAQ. Where there were significant differences between groups, the intervention group had stronger attitudes to certain aspects of eating. Some of these attitudes are possibly influenced by food-related parenting strategies, such as the child thinking that it was '*important to eat everything on their plates*' (Birch et al. 1987, Wansink 2009). Chadwick et al. (2013) describe desirable behaviours influenced by parenting, which promote greater levels of breakfast eating, for example, or undesirable behaviours which include pressure to eat and high levels of parental control over eating. In question 8, where more of the intervention children than the control group are '*never*' doing something at the same time as eating, reflects the idea that distractions whilst eating can lead to overeating at mealtimes or at other eating occasions (van't Riet et al. 2011) and is potentially a basis for developing overweightness or obesity.

Anthropometrics

The children's BMI measurements were consistent with data for England (Office for National Statistics 2012) for children of normal or overweight or obese classifications. The results for the proportion of underweight children was significantly higher than that for England (Office for National Statistics 2012). Levels of deprivation are higher than average in Wigan and adults have a lower life expectancy than the England average; 11.1 years for men and 8.0 years lower for women (Department of Health 2013). These and other factors may be contributing to this high level of under-weight in the CHANGE! participants. Additionally the NCMP uses data from the UK1990 Growth Reference charts which are derived from UK data only, compared to the IOTF cut-offs which are derived from data from six countries, including Great Britain (National Obesity

Observatory 2011). The two BMI classification systems are, therefore, incompatible and this could cause the disparity between the numbers of participants in the classifications for underweight. It has been shown in a recent study (Gonzalez-Casanova et al. 2013) that when the findings from a study comparing overweight and obesity in female children according to the IOTF, World Health Organisation (WHO), and Centers for Disease Control and Prevention systems, significant differences between the systems were documented.

4.6 Conclusion

In conclusion, the data collected at baseline, to compare the control participants with the intervention participants determined that the groups were alike and therefore, that at post-intervention, any changes to the children's food intakes, food knowledge and attitudes to eating, would be more discernible. Where differences were apparent at baseline, it was necessary to take these into account when interpreting the post-intervention data. Any further differences at post-intervention would then need to be carefully interpreted to determine if they were as a result of the intervention teaching programme.

Chapter 5

A quantitative description of the post-intervention data

5. A quantitative description of the post-intervention data

5.1 Introduction

Using the two models of intervention (see chapter 1), 'Planet Health' (Carter et al. 2007) and 'Eat Well and Keep Moving' (Cheung et al. 2007) were chosen as the resources around which to base the CHANGE! intervention because they had been successfully employed in the US (Gortmaker et al. 1999b, Wiecha et al. 2004) and in the south-west of England (Kipping et al. 2010). Permission was sought by the Principle Investigator for CHANGE! and granted by the publishers, for the CHANGE! study to utilise and anglicise sections of the 'Planet Health' and 'Eat Well and Keep Moving' teaching programmes.

For the purposes of the nutritional aspect of the study, the 'Eat Well and Keep Moving' resource was solely used, and only those sections relating to food and nutrition were utilised. 'Eat Well and Keep Moving' was also chosen as the resource to use because the teaching material was more age-appropriate for the population under investigation, as it was written for fifth-graders in the US (10 to 11-year olds in the UK) and because the material in the resource was more appropriate for the healthy eating messages that were considered important for this age group. At the time of the intervention period (2010-2011), the children taking part were between 10 and 11-years of age. At this age they are starting to gain more independence from their 'nutritional gatekeepers' (Chadwick et al. 2013) and will therefore have more autonomy in their food choices, particularly outside of the home and as they start their secondary level of education and enter adolescence (Roblin 2007). This guided the choice of material to use in the CHANGE! intervention teaching programme, as well as using the data derived from the focus groups in the formative stage of the study (see Boddy et al., 2012, appendix 9.8).

The CHANGE! intervention curriculum emphasised healthy eating as part of a healthy lifestyle. With the increasing freedom in the lives of the participants, CHANGE! aimed to provide some guidance and knowledge about how and why to adopt healthier eating behaviours in terms of food choice. This was approached in the intervention teaching resource by discussing:

- Energy balance
- The importance of eating breakfast
- Why some types of carbohydrates are better for you than others, such as wholegrain types
- Hidden sugar in foods and drinks and how to look out for them on labels
- Hidden fat in foods, types of fat, and how to look out for them on labels
- The benefits of fruits and vegetables in the diet
- How to choose a healthier snack
- The role of a balanced and varied diet.

The prevailing theory of energy balance to maintain or lose weight (or indeed to increase weight) is still the dominant model from which to evaluate 'energy in', and 'energy out'. It is also a concept which is comprehensible to children and encompasses aspects of the National Curriculum such as mathematics, so it fulfilled several criteria for inclusion. Additionally, WHO (2013) examined the evidence for factors which might promote or protect against weight gain and obesity. Aspects of their summary (World Health Organisation 2013) were closely allied with the rationale for CHANGE!:

Table 5.1: Summary of strength of evidence (modified for CHANGE!)

Evidence	Decreased risk for obesity/weight gain	Increased risk for obesity/weight gain
Convincing	• Regular PA • High dietary intake of NSP	• Sedentary lifestyles • High intake of energy-dense, micronutrient-poor foods
Probable	• Home and school environments that support healthy food choices for children	• High intake of SSSD and fruit juices • Adverse socio-economic conditions
Possible	• Low glycaemic index foods	• Large portion sizes • High proportion of food prepared outside the home • 'Rigid restraint/periodic disinhibition' eating patterns
Insufficient	• Increased eating frequency	

(World Health Organisation 2013)

The importance of eating breakfast was chosen as a topic in the intervention programme for the children to explore, as research has shown that adults and children, to varying degrees, who regularly skip breakfast are more likely to have a high BMI, being more prone to be deficient in micronutrients which are not compensated for at other eating occasions, have a tendency to consume energy-dense snacks throughout the day, and for children, breakfast 'skipping' tends to impede performance at school through lack of concentration and lower cognitive abilities (Hoyland et al. 2012, Monteagudo et al. 2012).

The role of different types of carbohydrates in foods and drinks, of fats in foods, and why fruits and vegetables should be consumed were also all considered important to be included by the research team. Whilst the teaching programme contained separate chapters on the 'best choice' carbohydrates such as whole grains and fruits and vegetables, including separate chapters on measuring the amount of sugar in SSSD, and looking for 'hidden' fat in foods, the subject matter was treated holistically to demonstrate to the children that foods are composites of different nutrients and that some foods can be high in fat, high in sugar, and could therefore be high in energy, for example.

The researchers predicted that the children would claim to eat particular types of foods, with some reportedly being consumed more than others, such as fruits and vegetables, and some potentially being under-reported, such as SSSD or high fat/high sugar snack foods, due to an inclination towards giving 'socially desirable' responses (Rangan et al. 2014). 'Social desirability' in over-reporting of foods in pre-adolescent children was found in other studies (Forrestal 2011, Lioret et al. 2011) which may influence fruits and vegetables reporting. It was also considered important that the children were made aware of the different terminology that is applied to these types of foods, for example, the names of some types of sugars that are found on food labels, so this was included in the teaching programme. All these factors were coupled with the idea of 'balance' or 'variety' in the diet.

Finally, each of the teaching sessions in the programme was aligned with subjects and specific sub-sections of subjects on the National Curriculum, such

as mathematics, English and science and placed in a matrix in the front of the teaching resource. This was so that the intervention school teachers could rapidly ascertain which aspects of the curriculum each of the chapters of the teaching intervention contributed to. This was also to encourage fidelity (Contento et al. 2002) of the delivery of the teaching intervention so that all participant children received the same experience.

5.2 Aims of the study at post-intervention

The aim of the post-intervention study was to measuring the control and intervention children's food intakes, their knowledge of foods and nutrition, and their attitudes to eating, using the same methods and techniques as used previously at baseline. This was principally to determine the impact of the intervention teaching programme. Any positive differences in food intakes, especially for fruits and vegetables, PMF and NMF between baseline and post-intervention could infer an effect of the teaching intervention on the intervention children. Likewise, any positive changes to their food knowledge scores or perceptions to some of their eating habits and attitudes may imply an effect of the teaching intervention.

All outcomes from this piloting of the teaching intervention, whether they were positive, negative, or not exhibiting any change, would be used to make an assessment of the efficacy of the existing teaching material and to inform any potential development of the intervention for future use. This would also apply to the tools used to measure any influence of the teaching intervention on food intakes, food and nutrition knowledge and eating habits and attitudes.

5.3 Methods

For detailed methods, please refer to the 'Methods' chapter of the thesis (pp. 33-51).

5.3.1. Teaching programme

The CHANGE! teaching programme was developed from 'Planet Health' (Carter et al. 2007) and 'Eat Well and Keep Moving' (Cheung et al. 2007) and re-written

by two members of the research team, in consultation with the whole CHANGE! research team.

The teachers in the intervention schools who were responsible for the delivery of the programme, received one training session about the curriculum. This was facilitated by a qualified, teacher-trained member of Wigan Council's Family Weight Management Service, who were supporting the delivery of CHANGE! in the participating primary schools but predominantly in the intervention schools who received the intervention teaching curriculum and associated resources.

The programme was based upon delivery over a twenty week period, with forty minutes to an hour teaching per lesson. There were eleven lessons based around nutrition and healthy eating, eight based around physical activity and reducing sedentary behaviour, and a quiz at week twenty. Each intervention school had the flexibility to timetable the twenty lessons according to their individual needs.

A curriculum pack was put together for each intervention school, including the teaching programme's lesson plans, homework tasks and a CD-rom for use in the classroom.

5.3.2. Data Collection

The data collection process was repeated as per the questionnaires used at baseline. Food intake, food knowledge and attitudes to eating were measured by the use of self-completed questionnaires (see Appendix 9.7). Each child who had consented to take part was given one questionnaire booklet to complete, which contained the three individual nutrition questionnaires. The children completed the questionnaires in the classroom, under the supervision of the researchers and they were able to ask the researchers questions if there was something they did not understand, to minimise any misunderstanding.

5.3.3. Data analysis

Each question was individually analysed using SPSS® 17.0 (SPSS Inc. Chicago, USA). Frequency tests, chi-square tests, McNemar's tests, independent samples

t-tests, paired samples t-tests, ANOVA and ANCOVA tests were used appropriately to determine any trends in the post-intervention data, to compare the data from baseline and post-intervention, and to determine if there were any significant differences between the responses from the control and intervention groups, at both data collection points. The corresponding p-values are stated in the text where applicable. Significance was deemed to be $p<0.05$.

5.4 Results

5.4.1. Food Intake

Eating breakfast

At the post-intervention data collection point, most children were still reportedly consuming breakfast (CON 89.3%; INT 91.0%). There was no significant difference between the control and intervention groups at post-intervention ($p=0.390$). There was also no significant difference between the control and intervention groups when baseline and post-intervention were compared ($p=1.000$). This indicates that there were no overall changes in the children's habits of consuming breakfast, at the population level.

Types of foods

There were more significant differences between control and intervention groups at post-intervention and their reported consumption of foods, than there was at baseline. Table 5.2 shows the frequencies of the reported intakes of both groups, and highlights those foods where there was a significant difference between groups at post-intervention (shown in red):

Table 5.2: Reported intakes of foods for control and intervention at post-intervention

	CON (%)	INT (%)	p value
Eat breakfast	89.3	91.0	0.390
Drink at breakfast**	72.7	84.3	**0.012**
Eat on way to school**	3.3	11.2	**0.009**
Drink on way to school	10.0	9.7	0.547
School dinner	46.0	50.7	0.248

Packed lunch	64.0	57.9	0.176
Home for lunch	2.7	0.8	0.225
Sugar cereal	30.9	35.8	0.225
Fibre cereal	26.2	32.8	0.136
Oat cereal	8.7	11.9	0.244
Non-sugar cereal	17.4	25.4	0.069
White bread**	60.1	71.2	**0.034**
Brown bread	30.0	36.8	0.137
Butter	52.7	58.5	0.191
Hard margarine	6.0	3.7	0.269
Soft margarine	6.0	6.7	0.497
PUFA margarine	26.2	29.6	0.303
Low fat margarine	6.0	11.2	0.087
Plain biscuits**	28.9	40.3	**0.029**
Chocolate biscuits	50.0	44.0	0.188
Cakes	24.0	27.6	0.288
Puddings	25.3	23.0	0.372
Sweets	38.7	38.8	0.539
Chocolate	50.0	48.1	0.423
Ice cream	25.5	32.8	0.110
Sugar in drinks	38.7	48.9	0.053
Sugar on foods*	43.2	32.8	**0.045**
Sweetener	7.3	6.0	0.414
Boiled potatoes**	5.3	19.3	**0.000**
Mashed potatoes	24.0	25.2	0.462
Baked potatoes	10.0	11.1	0.454
Roast potatoes**	10.7	23.1	**0.004**
Chips**	35.3	47.4	**0.026**
Crisps	34.0	43.0	0.076
Fruit	76.0	74.4	0.433
Baked beans	18.7	19.3	0.509
Salad**	25.3	48.9	**0.000**
Fried vegetables	10.7	17.8	0.060
Vegetables	44.3	47.8	0.321
Burgers**	7.3	15.6	**0.022**
Sausages	15.3	21.5	0.117
Low fat burgers	2.7	3.0	0.579
Low fat sausages	5.4	8.9	0.177
Meat pies	12.1	18.5	0.089
Meats	57.8	65.9	0.105
Battered fish	4.7	4.4	0.578
Fish	13.5	12.6	0.480
Cheese	29.3	27.6	0.425
Soft cheese	8.0	11.9	0.186
Low fat cheese	7.4	5.2	0.311

Takeaways	20.7	21.5	0.490
Added salt**	30.4	41.0	**0.041**
Fizzy drinks	38.0	47.4	0.069
Diet fizzy drinks	34.7	37.0	0.385
Cordial	68.7	61.9	0.143
Diet cordial	20.1	18.7	0.436
Full fat milk	15.3	16.4	0.465
Semi skimmed milk	59.7	61.5	0.429
Water	85.2	83.0	0.359
FSM	12.0	17.8	0.114

*Control > intervention; p=0.045.
**Intervention > control; ↓p≤0.041.

Significantly more of the intervention children reported having a drink at breakfast time, to have eaten at school, eaten white bread, plain biscuits, boiled potatoes, roast potatoes, chips, salad, burgers, and added salt to their food, than the control children (see table 5.2). The types of foods where statistically significant differences have occurred are not consistent with those at baseline and there are a greater number of foods, eleven in total, where reported consumption is significantly different.

Significantly more of the control children reported adding sugar to foods than the intervention children (p=0.045). This is not consistent with the results for the control children at baseline. At baseline, it was the intervention children who significantly reported adding sugar to foods (p=0.049) rather than the control children.

Of the foods where there was a significant difference between the reported consumptions of foods for control and intervention, only 'boiled potatoes' and 'salad' are considered foods that would be recommended by a health professional to be consumed regularly in a balanced and varied diet. They are also two of the foods that appear as part of the PMF food list. The other foods or food habits (e.g. 'adding salt to food') where differences have occurred, with the exception of white bread, are foods that appear on the NMF list and therefore should not form a regular part of a healthy diet.

When the intakes of each of the types of foods were compared for control and intervention, between their baseline and post-intervention reported intakes, there were significant differences between the following foods for each group:

Table 5.3: Reported intakes of foods for control and intervention when compared at baseline and post-intervention where differences have occurred

Food types	CON (%)		INT (%)		
	BL	PI	BL	PI	p value
Soft margarine**	9.4	6.0	**14.9**	**6.7 ↓**	**0.019**
Sugar on foods*	**21.5**	**43.0 ↑**	31.6	33.1	**0.000**
Chips*	**47.0**	**35.6 ↓**	40.7	47.4	**0.050**
Crisps*	**46.6**	**33.8 ↓**	44.4	43.0	**0.018**
Fried vegetables*	**19.0**	**10.2 ↓**	16.8	17.6	**0.035**
FSM**	16.2	12.2	**27.2**	**18.2 ↓**	**0.017**

*Control > intervention
**Intervention > control

The list of foods shown in table 5.3, indicate that the control group had more significant differences in their reported intakes between baseline and post-intervention than when compared with the intervention group just at post-intervention. The percentage of control participants reporting putting 'sugar on foods' almost doubled at post-intervention from baseline, which is of concern. There was a reduction in the percentage of control participants reporting consuming chips, crisps and fried vegetables between baseline and post-intervention.

There was a significant reduction in the percentage of intervention participants reporting consuming soft margarine and reporting having FSM.

When the IMD score quartiles for the control group were compared to those for the intervention group for FSM at post-intervention, the intervention group contained more participants overall (n=24; CON n=18) (see table 5.4):

Table 5.4: Children reporting eligibility for FSM and their associated IMD score quartile at post-intervention

IMD score quartile	CON (*f*)	% of FSM group	INT (*f*)	% of FSM group
1.0 least deprived (6.08-12.37)	3 (5)	20	1 (1)	3
2.0 (12.38-23.38)	5 (3)	12	2 (8)	21
3.0 (23.39-40.76)*	2 (8)	32	8 (11)	29
4.0 most deprived (40.77-66.33)	8 (9)	36	13 (18)	47
Total (n)	**18 (25)**	**100**	**24 (38)**	**100**

(Baseline count is shown in brackets)
*Wigan, IMD score 26.00
*CHANGE!, all participants, mean IMD score 27.85

This demonstrates a considerable reduction in the number of children reporting that they were eligible for FSM at post-intervention despite no changes between data collection points in the numbers of participants per IMD score quartile.

PMF and NMF

The control and intervention groups were compared to determine the frequencies of the reported consumption of PMF and NMF at post-intervention (see table 5.5).

Table 5.5: Frequency of consumption of PMF and NMF by control and intervention at baseline and post-intervention

BL		**PMF**	**NMF**		**PI**		**PMF**	Change from BL	**NMF**	Change from BL
CON	Mean	5.49*	7.63		**CON**	Mean	5.76**	↑	7.15	↓
	SD±	2.64	3.63			SD±	2.65		3.53	
INT	Mean	6.65*	8.14		**INT**	Mean	6.44**	↓	7.99	↓
	SD±	3.24	4.01			SD±	2.92		3.88	

*(INT>CON, p=0.001) **(INT>CON, p=0.039)

These figures indicate that for both groups their mean intakes of NMF had marginally decreased between baseline and post-intervention, and for the control group only, their PMF intakes had increased slightly. The mean intakes for the intervention group had slightly decreased for PMF.

When the reported intakes for each group were compared for post-intervention, there were no significant differences for NMF (p=0.054). There were, however, significant differences between the groups at post-intervention for PMF (p=0.039) with the intervention group reportedly consuming significantly more PMF than the control group.

There was no significant difference for control and intervention between baseline and post-intervention for either PMF or NMF (p≥0.101).

When the diet score percentage was calculated for each participant from the %PMF and %NMF, scores ranged from -63 (all/most foods NMF) to +53 (all/most foods PMF). The participants were separated into two groups:

- **Those participants with a score of -63 to -1:** classed as needing to considerably improve their diets or needing some improvement in their diets; described as 'lower quality diets.'
- **Those participants with a score of 0 to 53:** classed as needing some improvement in their diets or already consuming a healthier diet; described as 'better quality diets.'

The mean diet score percentage for all participants was -1.22% at post-intervention, which indicates a small increase of 1.48% in diet quality from baseline (-2.70%).

The mean diet score percentage for the intervention group was lower at post-intervention than the control group (INT: -1.29%; CON: -1.16%) (See table 5.6). This indicates an improvement in diet quality for the control group from baseline and a decline in diet quality for the intervention group, which implies an increase in the reported consumption of NMF over PMF between baseline and post-intervention. There was no significant difference between control and intervention at post-intervention (p=0.949).

When mean diet score percentage for control and intervention were compared at baseline and post-intervention, there was a significant difference for the control group between their baseline and post-intervention scores (p=0.018):

Table 5.6: Mean diet score percentage scores for each group at baseline and post-intervention

	CON	INT
Mean diet score %, BL	-4.37*	-0.87
Mean diet score %, PI	-1.16*	-1.29
Difference	+3.21↑	-0.42↓

*(p=0.018)

This data shows an increase (or some improvement) in the diet score percentage for the control group but a decrease (or some decline) for the intervention group. This difference between control and intervention when compared at baseline and post-intervention was not significant (p=0.807).

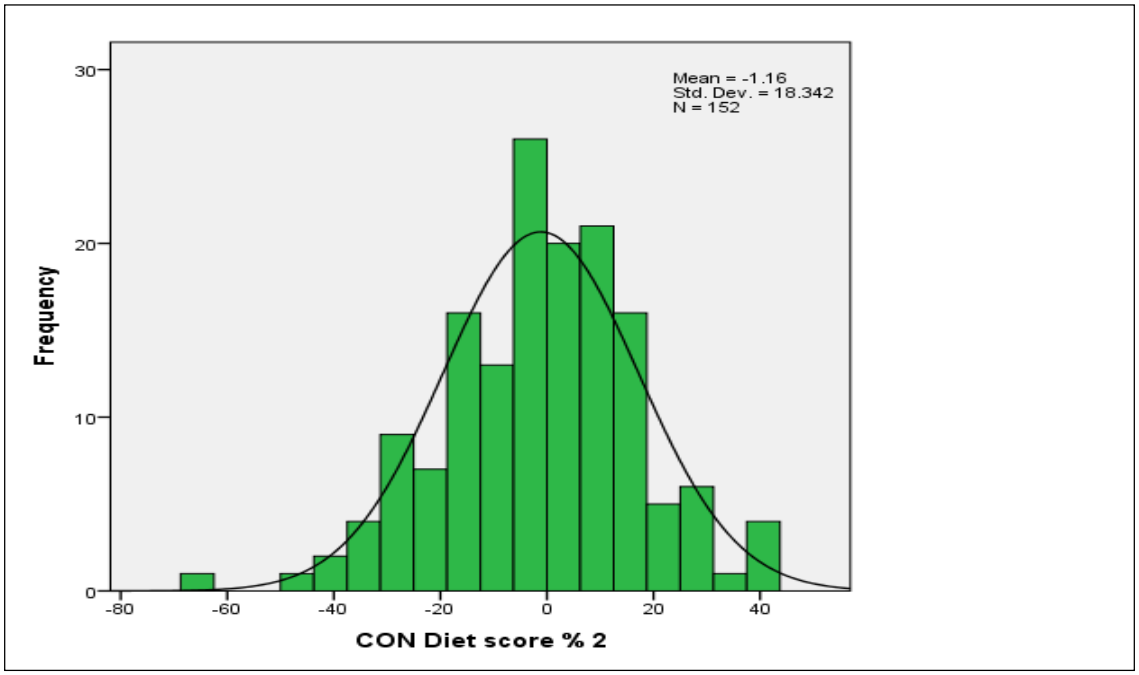

Figure 5.1: Frequency of diet score percentage for control group at post-intervention

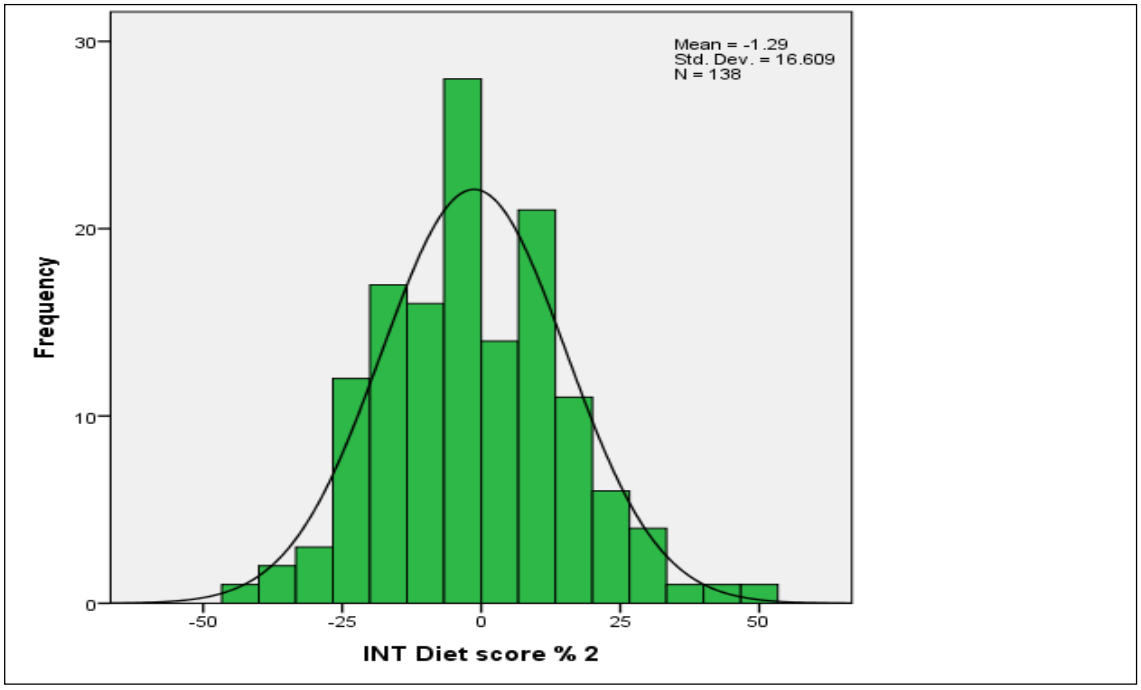

Figure 5.2: Frequency of diet score percentage for intervention group at post-intervention

Overall, there was no significant difference between the control and intervention groups when baseline and post-intervention data collection points were compared (p=0.337) for diet score percentage.

Fruits and vegetables – 24-hour recall and number of portions

The data shows that 85.6% of all participants reportedly consumed fruit at baseline but by post-intervention this had reduced to 81.8%. This was not a significant difference when baseline was compared to post-intervention for all participants (p=0.321).

There was a small increase in the reported consumption of vegetables by all participants, from 58.5% at baseline to 61.2% at post-intervention. This was not significant when baseline was compared to post-intervention for all participants (p=0.627). This implies that although there were no statistically discernible changes to the children's intakes of fruits and vegetables at either data collection point, there were reportedly a small increase in vegetable consumption in a small proportion of participants.

There were also no significant differences between control and intervention when baseline and post-intervention were compared for both fruits and vegetables (p≥0.080). This suggests that the 'healthy living' aspects of the CHANGE! programme – including a guideline to *'eat five or more servings of fruit and vegetables each day'* (chapters 1 and 10 of the teaching programme) - which was delivered for the intervention group, did not appear to be effective.

Similarly to baseline, the children were asked to report *'how many portions of fruits [or vegetables] did you eat yesterday?'* including the same instructions about what constitutes a portion. A range of answers were given ranging from zero (0) to 9+ portions of fruits and vegetables. There was a small increase in the mean number of portions of fruit reportedly consumed between baseline and post-intervention, but a small decrease for vegetables (see table 5.7) but this was not significant (portions of fruit; p= 0.219; vegetables; p= 0.638) for all participants.

Table 5.7: Mean reported number of portions of fruit and vegetables at baseline and post-intervention

	BL	PI	
Portions of fruit	2.35	2.60	↑
Portions of vegetables	2.13	2.04	↓

Additionally, 14.7% of participants (n=42) reported at post-intervention that they had not consumed any (0 portions) fruits the previous day and 22.2% (n=63) had not consumed any vegetables. Similar to the findings at baseline, there is evidence of mis-reporting of fruits and vegetables intake at post-intervention. This data indicates that a proportion of both the control and intervention participants reported '*yes*' for fruits and vegetables consumption but then reported zero (0) for the number of portions of fruit or vegetables, which has distorted the data (see table 5.8):

Table 5.8: Reported fruits and vegetables consumption for control and intervention groups at post-intervention

	CON (%)	INT (%)
FRUITS		
'YES'	76.0	74.4
'0' portions reported	13.3	16.3
Therefore, 'YES' to 1 or more portions	86.7	83.7
Difference	**-16.7**	**-9.3**
VEGETABLES	**CON (%)**	**INT (%)**
'YES'	44.3	47.8
'0' portions reported	23.3	20.9
Therefore, 'YES' to 1 or more portions	76.7	79.1
Difference	**-32.4**	**-31.3**

Reflecting on UK dietary recommendations to consume five or more portions of fruits and vegetables per day (and the guidelines taught in the CHANGE! programme) as part of a healthy diet and lifestyle, the following participants reported that they had consumed five or more portions of fruits and/or vegetables at post-intervention. Baseline data is included for comparison:

Table 5.9: Participants (n) who consumed five or more portions of fruits and vegetables the previous day at post-intervention

	BL		PI	
	CON	INT	CON	INT
Fruits only (>5, no veg)	3	1	22	25
Vegetables only (>5, no fruit)	0	0	16	21

There are significant increases displayed for both control and intervention participants from baseline in their reported consumption of five-or-more portions of either fruit alone or vegetables alone, at post-intervention. This finding needs to be treated with caution due to the discrepancies displayed in the reporting of fruits and vegetables in this study (see tables 4.7 and 5.8).

5.4.2. Food Knowledge

Ingredients

Frequencies were calculated for the ingredients questions, comparing all participants (see table 5.10):

Table 5.10: Participants who correctly identified some or all ingredients at post-intervention

	Number of ingredients correctly identified by participants (%)				
Ingredients	**0**	**1**	**2**	**3**	**4**
Coleslaw	40.7	25.6	27.0	6.7	n/a
Lentil soup	56.8	17.2	18.6	6.7	0.7
Bread	26.7	38.9	25.3	9.1	n/a
Apple crumble	16.8	41.8	29.8	8.4	3.2

Although the percentage of participants scoring zero (0) had decreased since baseline, these percentages still imply a low-level of knowledge of ingredients for particular foods.

The scores for each ingredient were added together and a total score for ingredients knowledge was calculated (out of 14) and a mean score determined for control and intervention. Mean scores had improved for each group at post-intervention:

Table 5.11: Mean total ingredients score for control and intervention groups at baseline and post-intervention

	CON	**INT**
Baseline	3.92*	3.18*
Post-intervention	4.57	4.07

*CON>INT, p=0.018

There was no significant difference at post-intervention between the scores for control and intervention groups (p=0.129) nor was there any difference between the groups and their total ingredients knowledge score when baseline and post-intervention were compared (p=0.204).

No participants correctly identified all ingredients at post-intervention; however one participant did score 13 out of 14 correct answers.

Self-assessed ability rating

Similarly to baseline, the children had to decide whether they could make a selection of nine different foods either '*all by myself*,' '*with a little help*,' '*with a lot*

of help,' or '*not at all*.' These scores were then added together to give a total score of self-assessed ability. Scores could range from zero (0) (e.g. the participant did not think that they were able to make any of the foods at all) through to a maximum score of 27 (e.g. a high belief that they were able to make all of the foods listed '***all by myself***'). There were three participants who scored the maximum score of 27 (CON n=2; INT n=1) and there were fifteen participants who scored zero (0) (CON n=10; INT n=5). The mean score at post-intervention was 14.76 for all participants.

Table 5.12: Frequency of self-assessed ability for all participants at post-intervention

	All by myself (%)	**With a little help (%)**	**With a lot of help (%)**	**Not at all (%)**
Stir-fry	9.2	36.6	28.2	26.1
Coleslaw	17.5	31.2	23.5	27.7
Boiled potatoes	30.2	37.9	13.7	18.2
Lentil soup	9.5	29.9	27.8	32.7
Apple crumble	17.0	39.9	22.6	20.5
Boiled rice	37.5	32.6	14.4	15.4
Pasta shells	39.6	28.8	16.8	14.7
Bread	32.7	32.4	22.5	12.3
Broccoli	40.0	29.1	14.0	16.8

For most foods, approximately 30-40% of participants reported that they would be able to make them from beginning to end, '*with a little bit of help*.' This is similar to the findings at baseline.

The greatest proportion of children reported that they would be able to cook boiled rice, pasta shells and broccoli '*all by myself*.' The control children were more likely to report higher self-assessed ability for pasta shells and broccoli compared to the intervention children, although the differences were marginal (pasta shells: CON 40.7%; INT 38.5%; broccoli: CON 41.3%; INT 38.5%). This is a discernible difference from baseline.

Lentil soup still had the greatest proportion of children who reported that they would not be able to make it from beginning to end. There were no significant

differences between control and intervention at post-intervention for their self-assessed ability (p≥0.096).

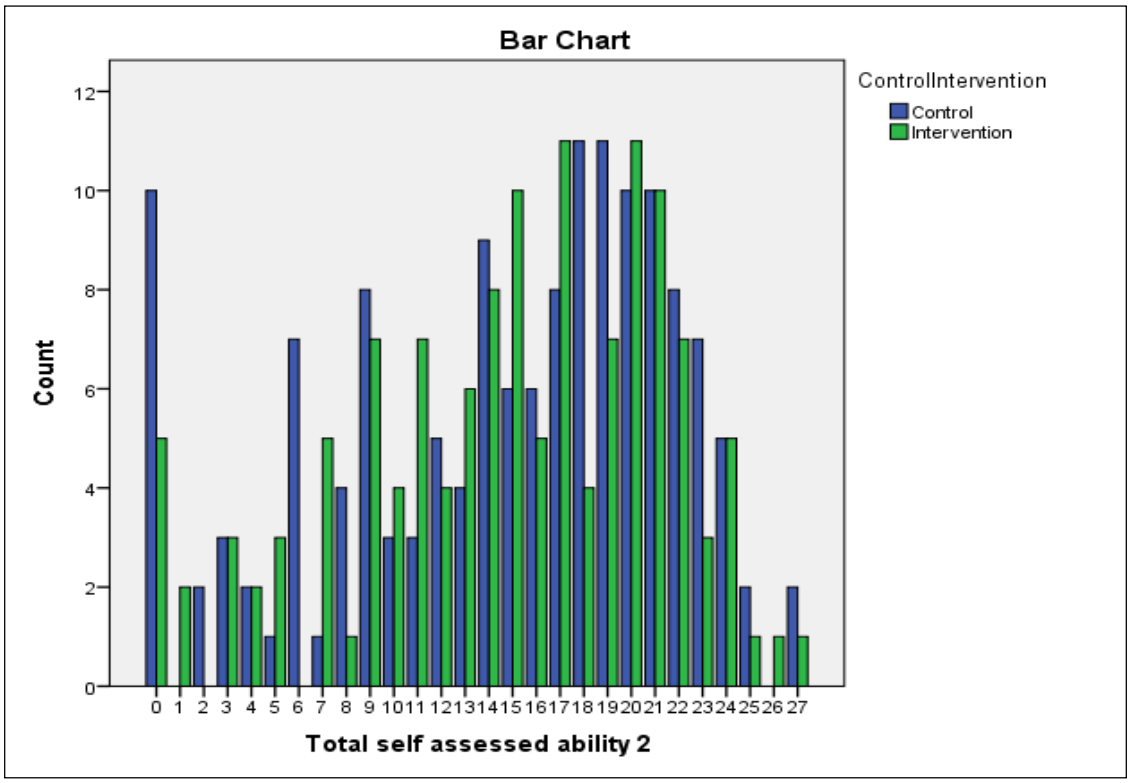

Figure 5.3: Frequency distribution for total scores for control and intervention self-assessed ability to make a range of foods at post-intervention

There was no significant difference between control and intervention groups at post-intervention for their total scores for self-assessed ability (mean scores: CON 14.73 ±7.05; INT 14.80 ±6.47; p=0.934).

Overall, there were some discernible changes to the self-assessed abilities of the children with particular foods (boiled rice, pasta shells, broccoli) but no significant differences between the control and intervention groups.

Nutrition knowledge

The nutrition knowledge part of the questionnaire was scored the same as at baseline (see chapter 4): there were nine questions in total with a possible total score of 13 attainable. At post-intervention there were zero (0) participants who scored zero (0). The lowest scoring participant (n=1) scored just 1 mark for the section. There were two participants (0.7%) who scored the maximum score of

13. These are different participants to those who scored 13 at baseline. Over half of the participants (42.9-63.1%) scored between 8 and 9 correct answers, with the mean score for all participants calculated as 8.58.

There were no significant differences between control and intervention groups at post-intervention (p=0.952), nor were there any significant differences between the groups at baseline and post-intervention (p=0.502) for nutrition knowledge. There was however a strong relationship between the baseline and post-intervention scores as indicated by a partial eta squared value of 0.200.

There was a small, insignificant increase in the percentage of participants who correctly answered question 15 about the Eatwell Plate: 75.3% at baseline and 78.8% at post-intervention (an increase of seven participants correctly answering the question at post-intervention).

Total Food Knowledge Score

The mean total Food Knowledge score achieved by all participants was 30.63, (SD±9.25) out of a possible total score of 59. This was an improvement from baseline where the mean score achieved was 28.26 (SD±9.72).

There was no significant difference between the control and intervention groups at post-intervention when their total Food Knowledge scores were compared (p=0.744). The total Food Knowledge scores had improved by post-intervention however, by 3.3 marks for the intervention group since baseline and by 1.55 marks for the control group.

Similarly to baseline, the SD of the mean scores indicates that the scores varied widely from the mean within each group:

Table 5.13: Mean scores for control and intervention groups for total food knowledge at baseline and post-intervention

BL	**CON**	**INT**		**PL**	**CON**	**INT**
Mean score	29.26	27.14		**Mean score**	**30.81 ↑**	**30.44 ↑**
SD ±	9.57	9.79		**SD ±**	9.51	8.97

There was no significant difference between the groups and their scores at baseline and post-intervention (p=0.300). There was however a strong relationship between their scores at baseline and post-intervention, as indicated by a partial eta squared value of 0.384.

5.4.3. Eating Attitudes

Each question was considered on an individual basis, as at baseline, and therefore an overall score was not be calculated from the EAQ. The findings for each question are reported individually.

Overall, there were no significant differences between control and intervention at post-intervention in the participants' responses to all EAQ questions (p≥0.067). This is different to baseline where questions 2 ('*I think it is important to eat everything on my plate at meals*'), question 8 ('*When I am eating, I'm often doing something else at the same time*'), and question 11 ('*My favourite treat is a food*'), all displayed significant differences between control and intervention.

The frequencies for the responses to the EAQ are presented in table 5.14. (Pages 98-99).

Table 5.14: Frequencies (%) of responses of control and intervention to EAQ per question at baseline and post-intervention

Question	CON		INT		CON		INT		CON		INT		CON		INT		CON		INT	
	BL	PI	BL	PI	BL	PI	BL	PI	BL	PI	BL	PI	BL	PI	BL	PI	BL	PI	BL	PI
	Never				Not often				Sometimes				Almost always				Always			
1. I usually finish eating before everyone else	11.9	8.7	14.7	11.9	26.5	33.6	25.0	32.6	43.7	43.6	46.3	41.5	13.9	10.7	8.8	8.9	4.0	3.4	5.1	5.2
4. I like trying foods that I haven't eaten before	7.9	8.0	12.4	11.9	13.9	14.7	13.9	11.9	40.4	44.0	38.0	31.1	13.9	12.7	8.8	20.0	23.8	20.7	27.0	25.2
5. If I see food I want to eat it	4.7	9.3	6.6	11.2	27.3	33.3	19.7	31.3	46.7	43.3	48.9	42.5	12.7	6.0	10.9	5.2	8.7	8.0	13.9	9.7
6. My favourite foods are always in the house	2.7	2.0	2.2	2.2	10.7	12.7	12.5	10.4	57.3	62.0	52.9	57.8	21.3	21.3	21.3	19.3	8.0	2.0	11.0	10.4
7. I can help myself to any foods in the house I want	22.5	25.3	11.9	11.9	27.2	30.0	28.9	39.3	30.5	28.7	37.8	28.9	13.2	10.0	13.3	11.1	6.6	6.0	8.1	8.9
8. When I'm eating, I'm often doing something else at the same time	21.3	26.0	33.6	27.4	28.7	32.0	26.9	24.4	33.3	33.3	29.9	34.8	6.0	6.0	6.7	8.9	10.7	2.7	3.0	4.4
10. I have to eat some foods I don't like, so that I can have foods I enjoy, like pudding	14.6	15.0	16.2	18.7	23.2	28.6	21.3	27.6	45.0	36.7	41.2	37.3	13.2	13.6	13.2	11.9	4.0	6.1	8.1	4.5

Table 5.14: Frequencies (%) of responses of control and intervention to EAQ per question at baseline and post-intervention (cont'd.)

Question	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI
	Not at all important				**Not very important**				**Makes no difference**				**A little important**				**Very important**			
2. I think it is important to eat everything on my plate at meals	3.3	3.3	3.6	3.0	12.6	8.7	4.4	6.7	5.3	10.0	8.0	8.9	49.7	41.3	42.3	39.3	29.1	36.7	41.6	42.2

Question	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI
	There's always not enough				**There's sometimes not enough**				**There's just the right amount for me**				**There's sometimes too much**				**There's always too much**			
3. I usually think that there's too much food on my plate	4.0	4.7	4.4	4.4	4.0	8.0	5.1	5.2	57.0	58.7	50.4	55.6	30.5	24.7	36.5	31.9	4.6	4.0	3.6	3.0

Question	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI	CON BL	CON PI	INT BL	INT PI
	Disagree a lot				**Disagree slightly**				**Don't know**				**Agree slightly**				**Agree a lot**			
11. My favourite treat is a food	8.6	11.3	8.8	11.1	22.5	22.7	10.3	17.0	25.2	30.0	25.7	25.9	27.2	23.3	25.7	32.6	16.6	12.7	29.4	13.3

For question 9 when they had to report what they would most likely be doing if they were doing something else at the same time as eating, over a fifth of participants per group reported that they would be watching television (CON 21.8%; INT 24.2%) and about a tenth of participants per group said that they would be playing on their computers, mobile phones or laptops (CON 11.6%; INT 11.4%). Over half the children per group reported that they '*never*' do something else whilst eating (CON 53.1%; INT 50.0%) (See figure 5.4). These responses are similar to those given at baseline. (See figure 4.4, p.67).

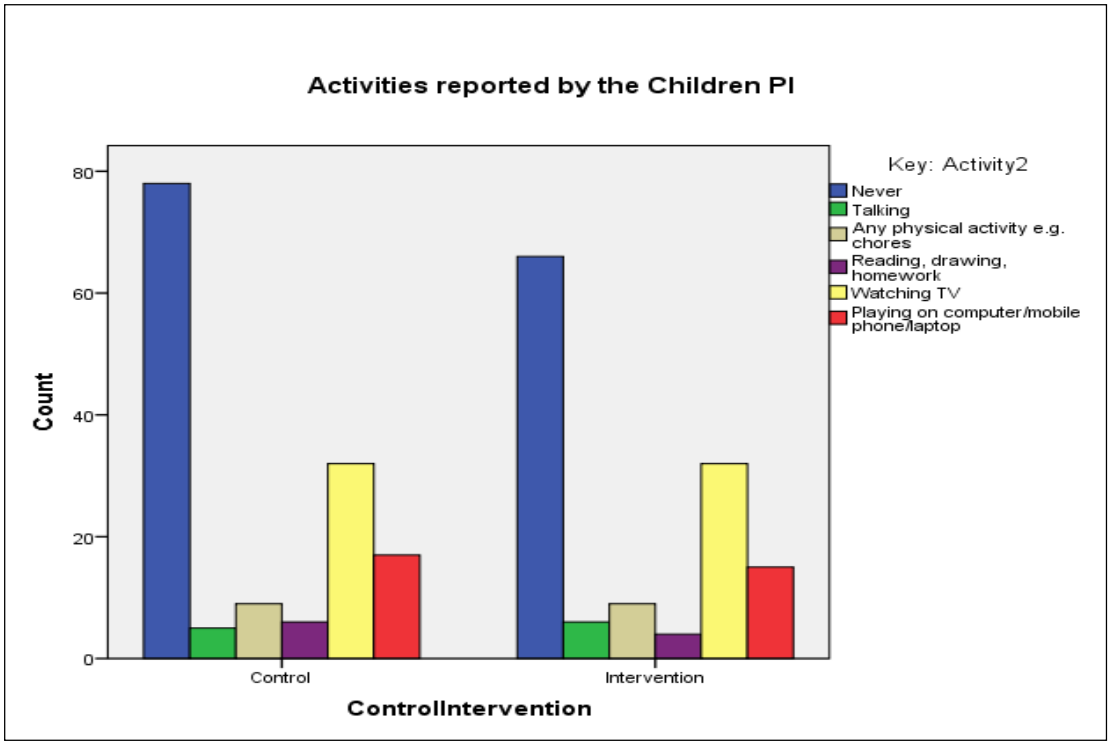

Figure 5.4: Activities that the participants were most likely to be doing if they were doing something else whilst eating at post-intervention

When the children were asked what their favourite foods were at post-intervention, the most popular answer was from the 'cakes, puddings and biscuits' category (CON 26.9%; INT 25.4%) as per baseline. The control and intervention groups then differed in their responses to the different categories of foods. See figures 5.5 and 5.6.

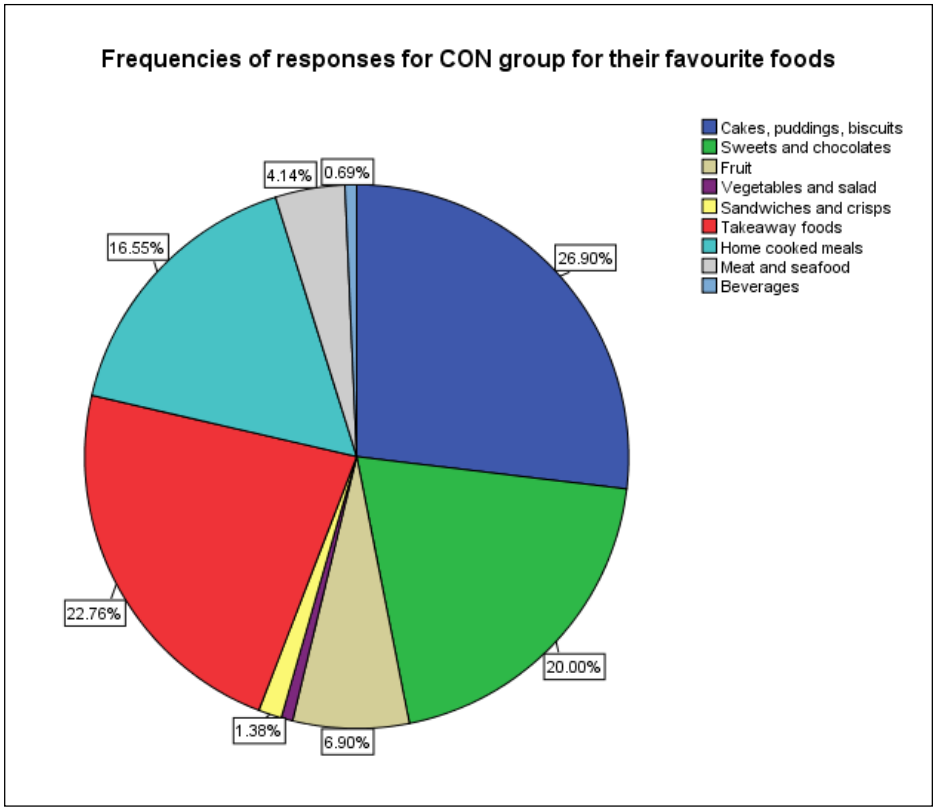

Figure 5.5: Frequency of responses for the control group for their favourite foods

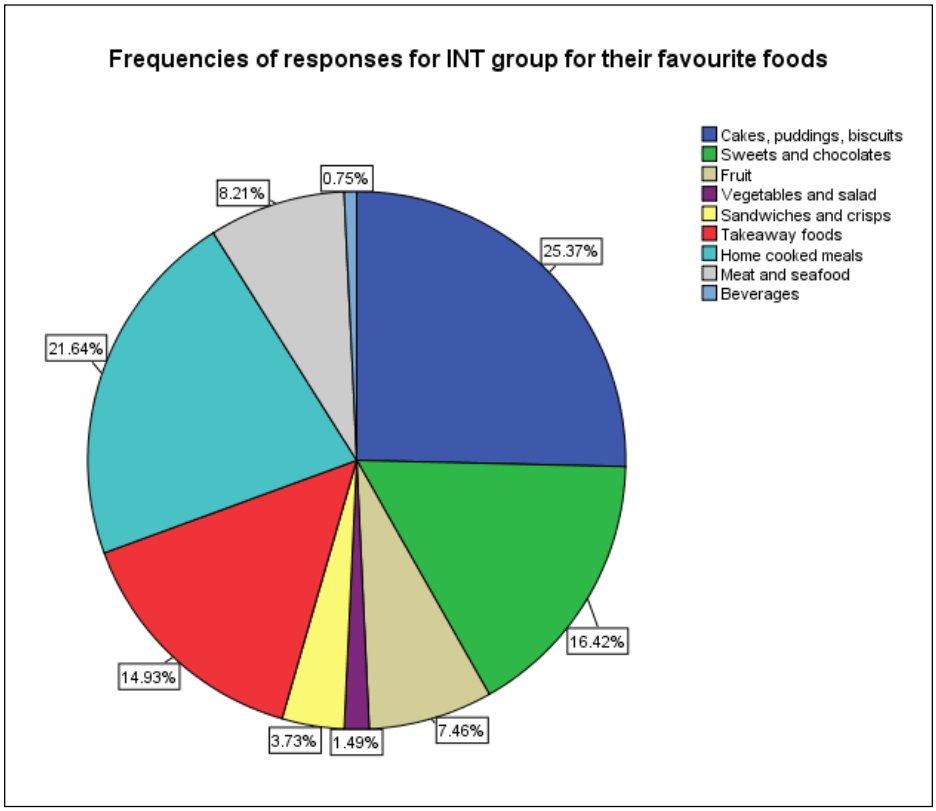

Figure 5.6: Frequency of responses for the intervention group for their favourite foods

The control group's second favourite choice of foods was 'takeaway foods' (22.8%) followed by foods in the 'sweets and chocolates' category (20.0%). The intervention group's second favourite foods were in the 'home cooked meals' category (21.6%) followed by foods in the 'sweets and chocolates' category (16.4%). Both the control and intervention groups had the smallest proportions of participants reporting 'beverages' and 'vegetables and salad' as their favourite foods (CON 'beverages' =8th, 'vegetables and salad' =8th, n=1 participant per food category; INT 'vegetables and salad' =8th, n=2 participants in that category, 'beverages' =9th, n=1 participant in that category).

These results from both baseline and post-intervention indicate that in the population studied, their favourite foods consistently are those types of foods which should be consumed less often in a varied and healthy diet, typically those high fat/high sugar/high salt foods. Those foods which should be eaten more often as part of a healthy diet were consistently in the least mentioned favourite foods, e.g. vegetables and salad.

5.4.4. Anthropometrics

The children's height (m), body mass (kg), waist circumference (m), and hip circumference (m) were measured and recorded at post-intervention. Their BMIs were calculated and classified according to the IOTF cut-offs (Cole et al. 2000).

There were significant differences between the heights and body masses of all participants between baseline and post-intervention (p=0.000):

Table 5.15: Mean heights and body masses of all children at baseline and post-intervention

		BL	PI
HEIGHT (m)	Mean	1.44*	1.47*
	SD ±	0.07	0.08
BODY MASS (kg)	Mean	37.37*	39.81*
	SD ±	9.00	9.79

As the figures show, there was an increase in mean height of 3cm between the data collection points and an increase in mean body mass of 2.44kg. These

changes in heights and body mass indicate a significant period of growth for all children between baseline and post-intervention.

At post-intervention there was a significant difference between control and intervention children for heights (p=0.001) but no significant difference for body mass (p=0.121).

Table 5.16: Heights and body mass of control and intervention at baseline and post-intervention

	CON			INT		
	BL	**PI**	**Difference**	**BL**	**PI**	**Difference**
Height (m)	1.45*	1.48**	0.03	1.42*	1.45**	0.03
Body mass (kg)	38.26	40.66	2.40	36.39	38.86	2.47

*CON > INT; p=0.000
**CON > INT; p=0.001

This data indicates that the significant period of growth was greater for the control children than the intervention children, but was not accompanied by a significant increase in body mass.

Over two-thirds of children (68.2%) were classified in the normal weight-for-age category, a fifth were classified as overweight-for-age (20.6%) and 11.1% were classed as underweight-for-age, according to IOTF cut-offs (Cole et al. 2000).

Table 5.17: IOTF classifications of BMI for control and intervention children at post-intervention

IOTF classes	**CON**	**INT**	**Total %**	**% per classification**
Grade 3 UW (%)	0.7	0.3	1.0	
Grade 2 UW (%)	0.0	1.0	1.0	11.1
Grade 1 UW (%)	6.6	2.5	9.1	
NW (%)	33.6	34.6	68.2	68.2
OW (%)	9.1	6.6	15.7	20.6
OW 2 (%)	2.8	2.1	4.9	
Total	**52.8**	**47.2**	**100.0**	**100.0**

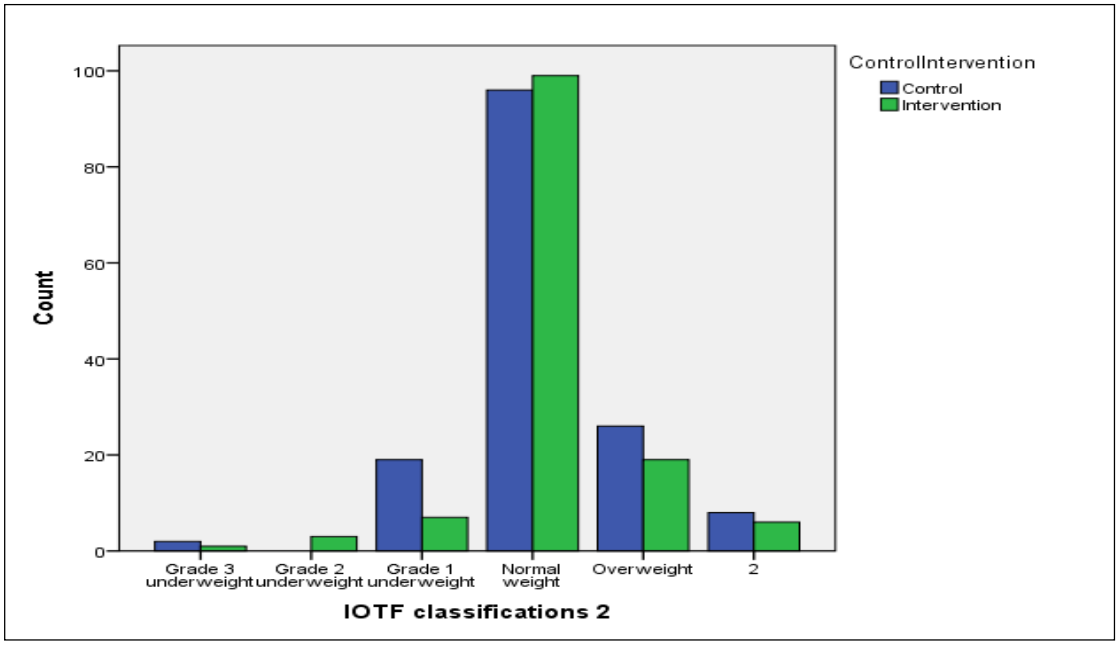

Figure 5.7: IOTF classifications of control and intervention children at post-intervention

The percentage of normal weight children at post-intervention (68.2%) was slightly higher than that reported for baseline (66.3% of all children).
The percentage of overweight children was 20.6%. This is effectively the same value as recorded at baseline (20.2%).

The prevalence of underweight amongst the CHANGE! participants, was higher than the reported data for NCMP. The total percentage between baseline and post-intervention however had fallen between baseline and post-intervention from 13.5% underweight (Grade 1, 2, and 3) to 11.1%. NCMP reported between 1.1 and 1.3% underweight (Office for National Statistics 2012).

The overweight children were further investigated to determine if the significant change in the heights of the children had had any bearing on their BMI status between baseline and post-intervention. This was determined by calculating the difference in the children's body masses between the data collection points. Inclusion criteria for this investigation included recorded as overweight or obese at either baseline or post-intervention, or at both baseline and post-intervention. There were 63 children from all the participants who met the criteria. Some children recorded different BMI categories at baseline and post-intervention (See figure 5.8).

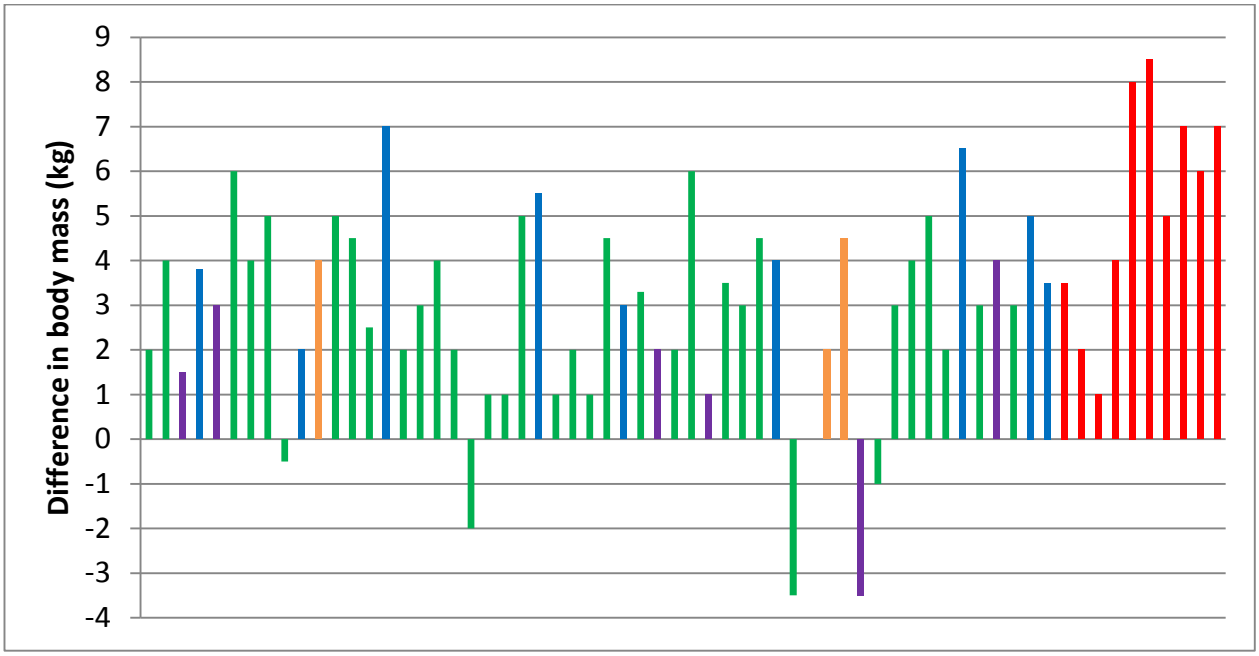

Figure 5.8: Differences in body mass for the overweight and obese children between baseline and post-intervention

Key:

Blue bars = normal weight at BL but overweight at PI
Purple bars = overweight at BL but normal weight at PI
Green bars = overweight children at BL and PI
Orange bars = children who were overweight at BL but obese at PI
Red bars = obese children at BL and PI

From this overweight and obese sub-group, there was one participant who recorded no body mass change over the data collection period and maintained an overweight BMI status for the study.

There were five participants whose body mass decreased over the data collection period. Of those five participants, four maintained an overweight BMI status and one changed status from overweight to normal weight. This participant lost 3.5kg between data collection points which equates to an approximately 8% weight loss (BL 45kg; PI 41.5kg).

There were three participants whose body mass increased from the overweight BMI category to the obese BMI category between baseline and post-

intervention. One of these participants had increased their body mass by approximately 10% between baseline and post-intervention (BL 43kg; PI 47.5kg).

All the participants (n=10) who were recorded as obese at baseline, remained obese at post-intervention. Some of this cohort had modest increases in their body mass at post-intervention, however two participants recorded increases in body mass of 8kg and 8.5kg respectively, which equates to approximately 10% (for 8kg increase) and 14% (for 8.5kg increase) increases in body mass over the data collection period.

Overall, there were more control participants (n=37) that recorded an overweight and/or obese status at baseline and post-intervention than intervention participants (n=27). Of the participants who recorded a decrease in their body mass over the data collection period, all were from the control participants group, including the participant who recorded no change in body mass and maintained an overweight BMI status. See figures 5.9 and 5.10.

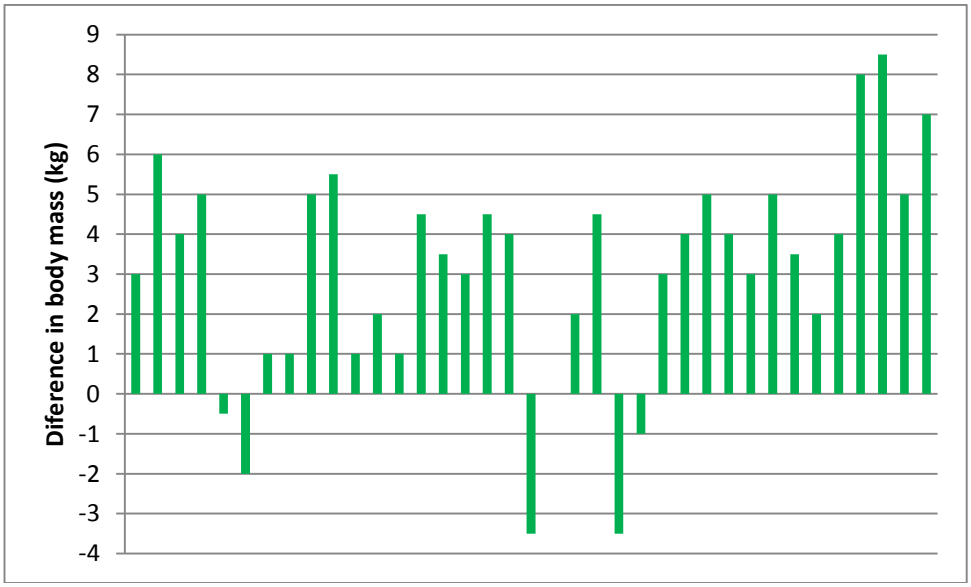

Figure 5.9: Differences in body mass for the overweight and obese control participants between baseline and post-intervention

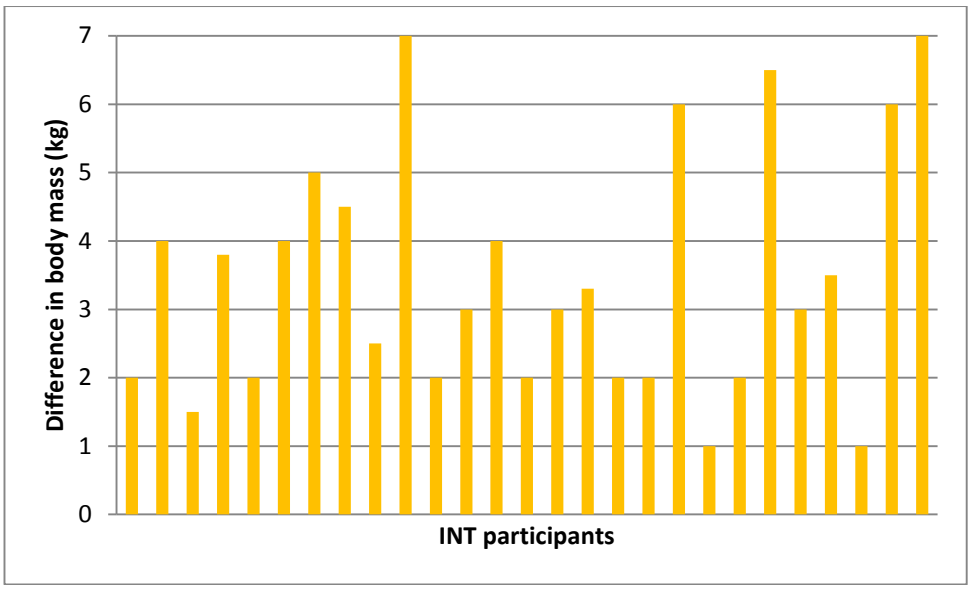

Figure 5.10: Differences in body mass for the overweight and obese intervention participants between baseline and post-intervention

5.4.5. SES and IMD data

The IMD data at post-intervention remained the same as at baseline. The mean IMD score for all children taking part in CHANGE! at post-intervention was 27.85, which was the same as the IMD score at baseline. This is a marginally higher score than the reported average score for Wigan (26.01) (Office for National Statistics 2011) and indicated a slightly higher level of deprivation across the participants than the Wigan average. The wide range of IMD scores however was still existent at post-intervention – a minimum score of 6.08 which indicates a lower level of deprivation through to a maximum score of 66.33, which indicates a higher level of deprivation amongst the participants. This confirms that the participants' socio-economic status did not change or alter over the intervention period and implies that most socioeconomic groups in Wigan were involved in the study.

Similarly to baseline, the IMD scores at post-intervention were recoded into quartiles. There were significantly more control children living in areas of low deprivation (1.00 quartile) than the intervention children (p=0.003); twice as many in fact (CON 17.3%; INT 8.6% of all participants). Likewise, there were almost twice as many intervention children living in the areas of higher deprivation (4.00 quartile) than the control group (CON 9.0%; INT 15.8%).

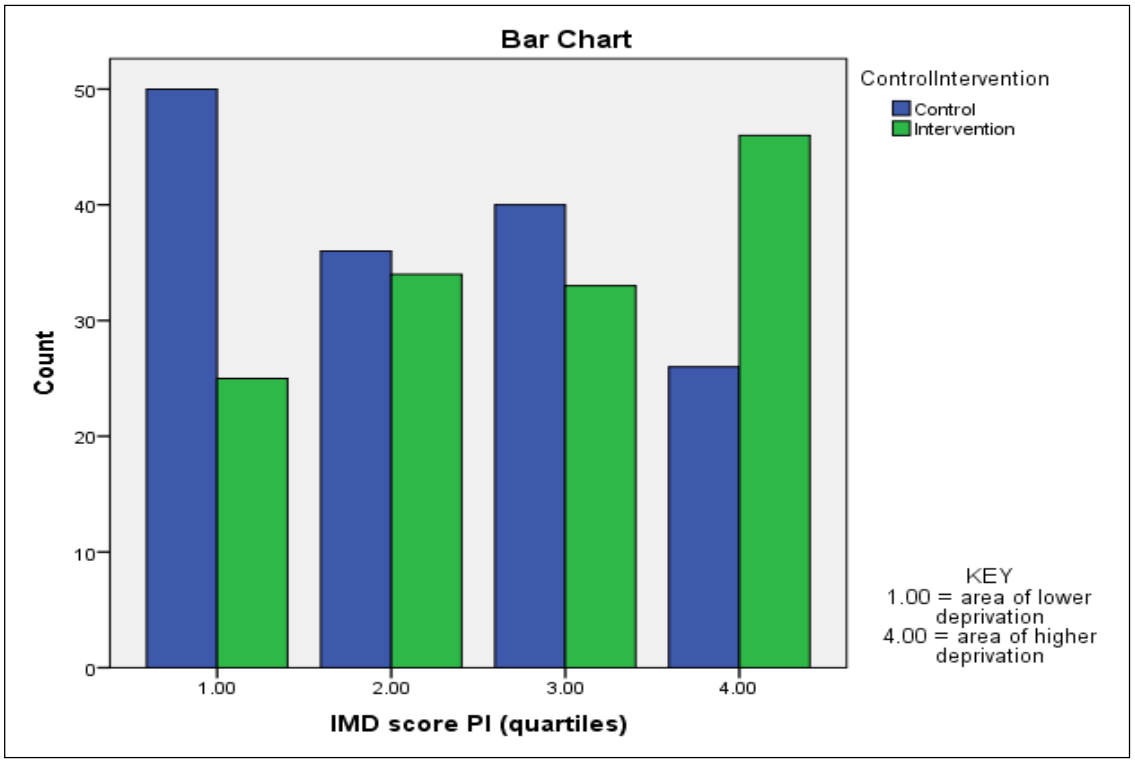

Figure 5.11: Frequencies of IMD score quartiles at post-intervention

There were no significant differences at post-intervention between the IMD score quartiles and reported intakes of fruit (p=0.123) and of vegetables (p=0.262). The reported intakes of fruits and vegetables consistently show however, that the children with the lower levels of deprivation (quartile 1.00) were *most* likely to have stated consuming fruits and vegetables the previous day. The children with the higher levels of deprivation (quartile 4.00) were the *least* likely to have reported consuming fruits and vegetables the previous day:

Table 5.18: Participants in each IMD score quartile who reported consuming fruits and vegetables at post-intervention

	IMD score quartiles				
	1.00	**2.00**	**3.00**	**4.00**	**Total**
Fruits (% of participants)	29.1	23.5	25.8	21.6	100.0
Vegetables (% of participants)	30.8	24.6	25.4	19.2	100.0
Totals 'YES'	59.9	48.1	51.2	40.8	

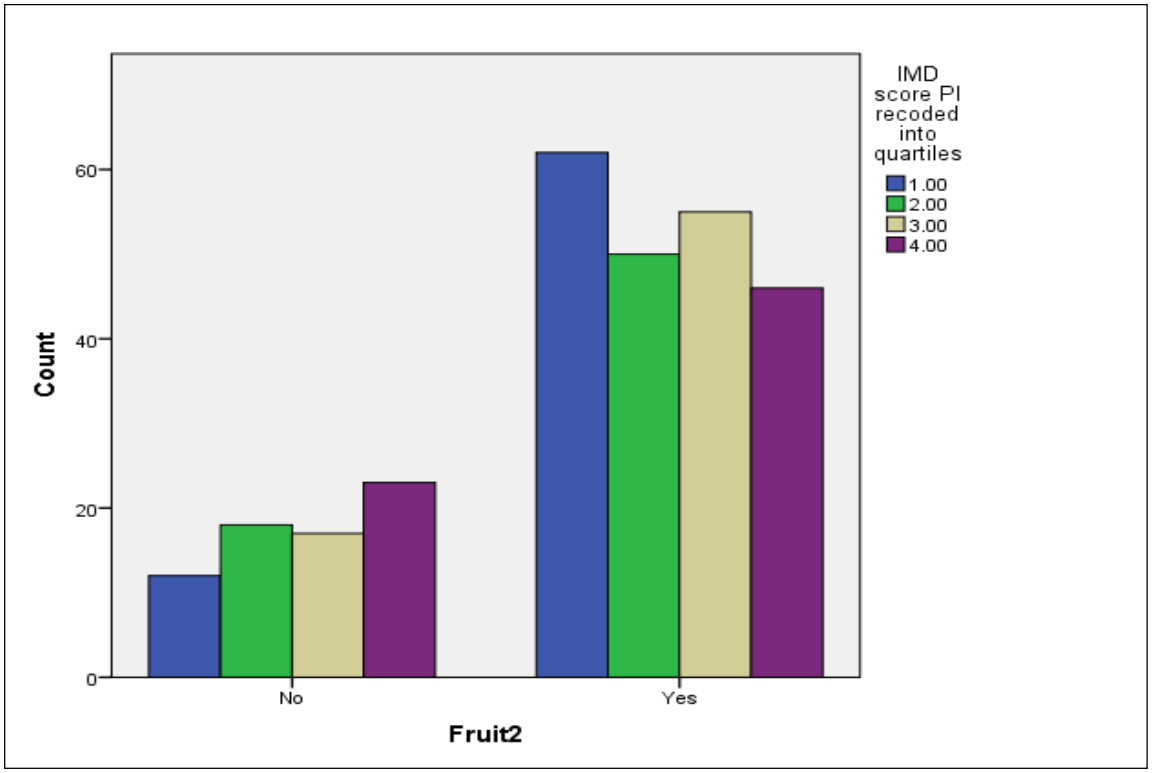

Figure 5.12: IMD score quartiles and reported intake of fruit at post-intervention

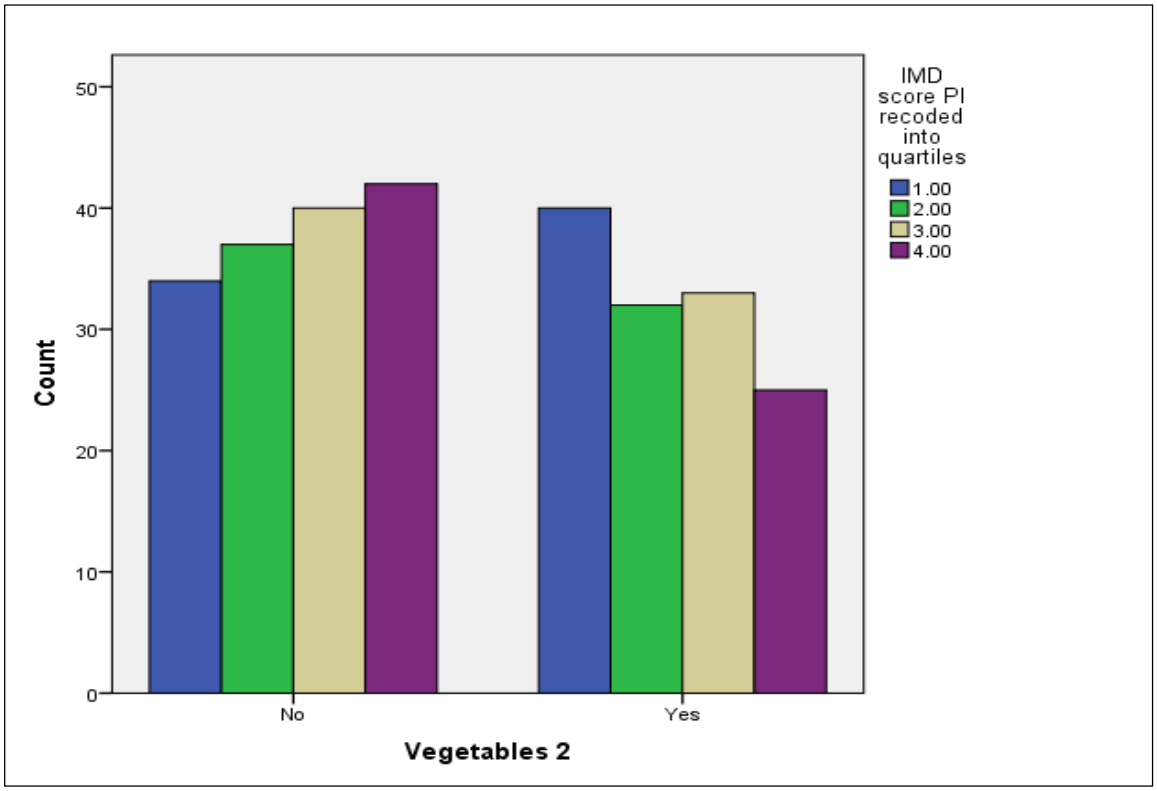

Figure 5.13: IMD score quartiles and reported intake of vegetables at post-intervention

There were no significant differences between the IMD score quartiles and their total scores for the Food Knowledge Questionnaire (p=0.250) at post-intervention. All their total mean scores however had increased from baseline, with the children in IMD score quartile 1.00 (areas of lower deprivation) still scoring the highest mean total score out of the four quartiles. (See table 5.19):

Table 5.19: Total mean scores for each of the IMD score quartiles at post-intervention

IMD score quartile	BL (mean score from a total of 59)	PI (mean score from a total of 59)
1.00	30.41*	31.89
2.00	28.44	31.50
3.00	28.53	30.08
4.00	25.38*	29.04

*1.00>4.00; p=0.024

Despite the increases in mean scores between baseline and post-intervention, there were no significant differences between the total mean scores for each IMD score quartile when compared at baseline and post-intervention (p=0.702). There was however a strong relationship between the baseline and post-intervention mean scores as indicated by a partial eta squared value of 0.375.

5.5 Discussion

The aim of the post-intervention study was to describe the CHANGE! participants post-intervention and to determine if the intervention schools had responded to the teaching intervention programme by making improvements to their food intakes, increased their knowledge of food and nutrition, and made any perceivable changes to their eating habits or attitudes to eating. The intervention schools were compared to the control schools for both post-intervention and baseline, in order to achieve this.

At post-intervention, the IMD scores of the participants were unchanged from baseline, therefore it was determined that there was a consistent cross-section representation of socioeconomic groups in Wigan in the CHANGE! study.

Food intake

There were no significant changes to the children's reports of eating breakfast but the data did indicate that a high proportion of children were consuming breakfast. This is a positive finding from the study; however a small but significant proportion of intervention children also reported 'eating on the way to school.' This suggests that amongst those children reporting eating breakfast, is a small proportion that is eating it on the way to school. Further study into the types of breakfast that can be eaten '*whilst on the way to school*' would provide details of the types of foods consumed at this eating occasion and therefore might provide opportunities within the teaching intervention to suggest ways to improve the quality of the foods being eaten for 'breakfast.' This is because children who regularly consume breakfast generally have improved fibre and calcium intakes and lower saturated fat intakes compared to those who do not (Coppinger et al. 2012). This can lead to maintenance of healthier weights and have improved cognitive function and improved academic performance (Hoyland et al. 2009).

There was a significant difference between the control group and the intervention group at baseline and post-intervention and their reported addition of sugar to foods. At baseline the intervention group reported as more likely to have added sugar to foods than the control group. By post-intervention, this trend had been reversed and it was the control group who were more likely to have reported adding sugar to foods, so much so that almost twice as many control children reported adding sugar to foods at post-intervention than at baseline (see table 5.3, p.86). As there was a focus on added sugar in the teaching intervention programme (which the control children had not received), there is possibly some effect of the teaching intervention curriculum on the intervention participants, although it is difficult to assess to what degree from the data collected.

Hence it is difficult from the data collected to ascertain why there was this shift in habits to increase their reported intakes of added sugar to this extent. Further investigation would be needed to determine what types of foods the sugar was being added to and what amounts were being added to foods, to try to evaluate the extent of the children's propensity for adding sugar to foods. Data from the EAQ at both baseline and post-intervention has determined that the children's

favourite foods centre on ‘cakes, puddings, and biscuits’ so there is some demonstration in this study of a preference for sweet foods. The recent results from the NDNS (Department of Health 2012) have shown that children aged 4 to 18 years old are consuming approximately 20g of these types of foods per day. The addition of table sugar to foods is approximately 6g per person per day. Overall, this age group 4 to 18 years old are consuming more than the recommended maximum intake for the day for extrinsic sugars (DRV for NMES of 11% of total energy or less) (Department of Health 1991) (see chapter 2, p.25). It is evident that the CHANGE! participants are typical of the English child population for their extrinsic sugar intakes. There is a need to change some of these food choice and eating behaviours as habits established in childhood can track into adulthood and be a risk factor for several chronic diseases including type 2 diabetes (Rasmussen et al. 2006).

Additionally there were significantly different reported intakes of eight different foods (*white bread, plain biscuits, boiled potatoes, roast potatoes, chips, salad, burgers, added salt*) when the intervention group were compared to the control group. There were also some reported differences between baseline and post-intervention. There does not appear to be a discernible reason for these differences, especially as they are not consistent with the differences at baseline. The data suggests that these differences have occurred arbitrarily, as just part of the daily decisions that are made about food, whether consciously or unconsciously. These decisions are under the influence of a complex ecological system which involves environmental, social, psychological and physiological influences (van't Riet et al. 2011). It has been proposed by Bisogni et al. (2007) that people’s eating occasions are shaped by not just ‘what’ they are eating – the types of food and drink - but also by the time, location, activities taking place, the social setting, mental processes, physical condition of the person, and the recurrence of the type of eating habit. Bisogni et al.’s study (2007) was carried out on adults but children are themselves subject to increasing episodes of eating outside the home and movement away from the more traditional forms of eating routines such as ‘breakfast’, ‘lunch’ and ‘dinner’ (Bisogni et al. 2007) which may be impacting upon the food choices the children are making and so accounting for some of the changes to the food intake data.

It has also been suggested that seasonality can have an influence on the types of foods that are eaten at specific times of the year (Calkosinski et al. 2009, Woolfe and Stockley 2005). Factors such as significant variations in light and light intensity, temperature, weather stimuli, and disturbances in the biological rhythm have been suggested as potential influencers to diet (Calkosinski et al. 2009) although more in-depth studies on humans and seasonality are still required. Potentially, seasonality is a factor here as the baseline data was collected in October and November, when the hours of daylight and temperatures are falling. The post-intervention data was collected in March and April the following year, when hours of daylight and temperatures are typically starting to increase.

Overall though, it appears that there was little recorded improvement in the diets of the children.

Assessment of the 'diet quality' of the participants displayed an equally indiscriminate pattern. Although both the control and intervention groups had decreased their reported intakes of NMF, the intervention group had also decreased their reported intakes of PMF. In contrast, at post-intervention, the control group had increased their reported intakes of PMF, but the intervention group were still reportedly consuming more PMF than the control group overall. This method of determining 'diet quality' from this 24-hour recall FIQ still requires further testing in order to ensure reliability and validity, so the data presented here needs to be viewed with some caution. It would be valuable in the future to have a method which would provide a rapid snapshot of the quality of a population of children's diet, constructed from types of foods, to provide an indication of the level of healthy eating behaviours. There is potential, with further research, for this tool to do just that.

There were no significant differences in the reported consumption of fruits and vegetables. There was evidence again of mis-reporting of the intakes and numbers of portions of fruits and vegetables reported by the participants with mismatched reports of consuming fruits and vegetables (or not) in the previous

24-hour period and then either reporting a disproportionate number of portions or indeed, none at all.

The mean number of portions of fruits and vegetables consumed in the previous 24-hour period was approximately four per participant, which is approximately one portion more than current UK figures for a similar age group (children aged 11-18 years, mean n=2.9 portions per day) (Department of Health 2012).

There is no obvious reason behind these inconsistencies in the fruits and vegetables data. Potentially, there is some, albeit small, effect of the intervention present. Potentially, there is a seasonal influence having an effect (Calkosinski et al. 2009, Woolfe and Stockley 2005). A more plausible reason is the 'Hawthorne effect.' This theory in its most basic terms, implies that the children behaved differently because they were *aware* they were being studied. It also implies that there was an effect of how the children *interpreted* the reasons for CHANGE! and the setting it was presented in (Chiesa and Hobbs 2008) (i.e. they knew that they should be consuming five or more portions of fruits and vegetables per day and therefore recorded it as such on the questionnaire, whether they had done so or not).

Additionally, the food intake data was collected on one day only and therefore any inconsistencies or discernible changes to the children's diets might not be detectable as the data collected might not accurately reflect typical intakes. The results might also display bias depending on the day surveyed (Boddy et al. 2013).

Food knowledge

At post-intervention there was still a low level of overall food knowledge amongst the participants. Their knowledge about the ingredients needed to make certain foods had not significantly changed, and a mean score of 4.32 out of a possible 14 marks implies a low level of familiarity with particular ingredients for foods.

There were however some differences between baseline and post-intervention with an increase in the participant's self-assessed ability to make certain foods at

post-intervention; specifically boiled rice, pasta shells and broccoli. This change was more apparent with the control children with pasta shells and broccoli and suggests that they had an increased familiarity with these types of foods. This might include having potentially assisted with the cooking of these foods at some point, between the baseline and post-intervention data collection points. As there were no formal practical cooking sessions contained within the CHANGE! intervention programme, then you would not expect to observe much change with the results from this part of the study, for either the intervention or the control children.

The 'lentil soup' question was still proving a challenge to the children with a high degree of unfamiliarity with what lentils actually were. The greatest proportion of children reported that they would not be able to make it from beginning to end. This data suggested that lentils do not culturally form a central part of their diets.

There is potential for these scores for ingredients knowledge and self-assessed ability to be improved if the questionnaire had been administered as part of a cookery club or similar within the school. In fact in the development of the 'Cooking Kids' questionnaire (Anderson et al. 2002) a practical cookery session was included to address some of these issues of lack of familiarity with certain foods and to ensure that the foods included on the tool were familiar to the children taking part. From the small amount of studies that have been carried out in this field, it is suggested that those children who are more involved with food preparation, have a healthier diet profile including a greater propensity for FV and a marked self-efficacy in these behaviours (Woodruff and Kirby 2013).

There was again no consistency with the results achieved at post-intervention with those achieved at baseline for nutrition knowledge. Those participants at post-intervention, who scored the maximum of 13, were not the same participants who scored the maximum at baseline.

There was an improvement in the mean scores for total food knowledge from baseline to post-intervention between the control and intervention groups, with the intervention group increasing their mean score by 3.30 marks from baseline.

Although this was not significantly different it could possibly suggest that there was some effect of the intervention programme, especially as the control group only increased their mean score by 1.55 marks from baseline. Further research would be needed to determine this and to ensure that it was not an effect from baseline, as detected in the statistical analysis.

Despite the statistics for this study revealing little in the way of *statistical* significant differences with food and nutrition knowledge, any small effect and improvement on knowledge which may result in an improvement in food choice decisions, may have a significant effect at the population level and in time, on public health (Wardle et al. 2000).

Eating Attitudes

Similarly to baseline, both control and intervention had corresponding attitudes to eating at post-intervention. There were no significant differences between control and intervention groups, or between the results for baseline and post-intervention.

There was still a strong response to question 2 where almost 80% of participants thought that it was '*a little important*' or '*very important*' to eat everything on their plates at mealtimes. This could have an implication with obesity status as some studies have reported a positive relationship with children's weight and 'pressure to eat' (Birch 1998, Chadwick et al. 2013, Wansink 2009). For this study, however, no such relationship appeared to exist.

Likewise, there was modest evidence of the children eating quickly or 'speed eating' (question 1: '*I usually finish eating before everyone else*') or of them responding to cues to eating (question 5: '*If I see food I want to eat it*') as the greatest proportion of responses from the children for each question was '*sometimes*.' Also '*when I'm eating I'm often doing something else at the same time*' (question 8) showed that this is not a habit with most children and that distractions during the eating occasion, are generally not present or permitted. These three questions reflect the viewpoints of the children from baseline as well as post-intervention, and demonstrated the importance of focusing on the eating

occasion. It also implies that there are possibly some restrictions imposed by parents on how the eating occasion is presented and the food served (Chadwick et al. 2013) and that the children are still able to respond to their internal satiety cues. This is because distractions whilst eating have been shown to be associated with overeating at mealtimes or at other occasions (van't Riet et al. 2011) which could lead to overweightness or obesity.

Anthropometrics

The changes to the children's heights and body masses indicate that some of the children had experienced a significant period of growth between the baseline and post-intervention data collection periods, which was to be expected with this age group. The control group were significantly different in height than the intervention group at baseline so it is realistic for this difference to still be present at post-intervention.

The percentage of children presenting as overweight was slightly higher than the reported prevalence for England (19.0%), North West (19.7%) and Wigan (19.3%), as reported from the NCMP (Office for National Statistics 2012) for year 6 children for the same school year. This implies that there was no change to the percentage of children presenting as overweight according to the IOTF cut-offs at baseline and post-intervention.

The overweight and obese children were investigated further to determine if the changes to the children's heights had had any bearing on their BMI status between baseline and post-intervention. From the data collected it is difficult to ascertain why particular children moved from one category – normal to overweight, overweight to normal, overweight to obese – apart from the recorded increase or decrease in body mass. Some children may have grown in height more than others and only slightly increased in body mass during this period which may explain why some children moved to the normal weight category. Others may have only marginally increased in height so any weight gain during the same period may have maintained their overweight status or even have made them eligible for the obese BMI category.

There were five overweight participants in the control group who actually decreased their body mass between baseline and post-intervention. The data collected does not determine why these particular participants decreased their body mass during this time. A similar change was not observed with the overweight and obese intervention participants. A focus on 'how' to make some of the changes suggested in the teaching curriculum, rather than 'what' to change, might have been of further benefit for these participants. This indicates that discussing how to make a change to behaviours with food intakes and food choices, might be beneficial.

The decrease in the percentage of children presenting as underweight at post-intervention suggests that those children who were underweight at baseline, were potentially in the normal weight category by post-intervention, indicating that they had grown into a normal weight-for-height and age by post-intervention.

The difference in the percentage of children presenting as underweight at both baseline and post-intervention when compared to the NCMP data, requires further detailed investigation to determine if the differences between the data sets are real, or if the different methods defining the cut-offs for children for IOTF and for the UK1990 Growth Charts, which were used for the NCMP, have introduced the difference between the CHANGE! and NCMP's measured populations.

5.6 Conclusion

In conclusion, there was no evidence of any substantive changes to the behaviours and knowledge of the intervention children following the completion of the intervention period. Any discernible changes that did occur were most likely to have occurred by chance; as an influence of the data collection at baseline, such as some of the food knowledge data; or as part of the children's normal growth and maturing, such as the change in mean height.

There were some positive outcomes from the study, such as the small increase in the ingredients knowledge scores and the total food knowledge score which suggests that the children were engaging with sections of the intervention, even if there were no sustained changes to behaviour.

Chapter 6

Synthesis of findings

6. Synthesis of findings

6.1 Recap of thesis

The main aim of this research was to develop, pilot and evaluate a healthy eating intervention for year 6 children in the UK. There were four stages of data collection for the study:

- A qualitative, formative study which utilised the PRECEDE-PROCEED intervention planning model (Green et al. 1980) to determine and assess the perceived needs of the children, parents and teachers who were involved in the study, so that the intervention could be designed around and address these needs.
- A baseline data collection (chapter 4) which aimed to quantitatively measure the food intakes, food and nutrition knowledge, and attitudes to eating of the participants before the intervention was delivered in the intervention schools.
- A post-intervention data collection (chapter 5) which took place following delivery of the CHANGE! healthy eating teaching curriculum by the teachers in the intervention schools, over a 20-week period. The same methods of data collection were used as those at baseline.
- A follow-up data collection (not reported in this thesis) which took place six weeks after the post-intervention data collection.

The results from the children's contributions to the qualitative study have been published elsewhere (see appendix 9.8). These showed that the children displayed some comprehension of what keeping healthy means and that it was inter-linked with eating the '*right*' kinds of foods, '*exercise*', and keeping your body '*strong*' and '*growing upwards instead of outwards*.' They were also able to give examples of those foods which are '*good*' for health and those which are '*bad*' for health. They were also able to acknowledge particular behaviours associated with foods such as hunger and the cues which made them want to eat, such as seeing food. The influence of the family was overwhelming, particularly around the more traditional eating occasions such as the Sunday roast or the Christmas Day dinner. This served to emphasise and reinforce the importance of the social and cultural contexts in which the children were living (Bisogni et al. 2012, Buttriss 2005).

The formative part of the study was unique in this type of intervention study. Whilst it is not uncommon for a theoretical framework such as Social Cognitive Theory to be used in nutrition research, the PRECEDE-PROCEED intervention planning model used for this study elicited the views and opinions of the target population so that the development of the CHANGE! intervention teaching curriculum was based on the findings from the consultation, and was therefore appropriate and relevant to the target population. This model has been associated with increased sustainability in interventions (Manios et al. 2012). The evidence supporting the importance of consulting the target population during the development stages of an intervention, however, is rarely reported in published intervention research articles, which is why the dissemination of the data from the formative stage of CHANGE! was critical. As stated in the introduction (p.4), Bronfenbrenner's ecological model of health [Brofenbrenner (1977) cited in (Golden and Earp 2012)] and his Ecological Systems Theory (1986) acknowledged that the ecological position of the child or children must be considered (DeMattia and Denny 2015) when designing and planning a healthy eating intervention such as CHANGE! Additionally, the sustainability of an intervention (if sustainability is a relevant outcome) and engagement in it, generally only tend to occur if the target population are involved during the development stages of the intervention, giving them greater control over their health and determinants (Taggart et al. 2012, Whelan et al. 2014). There were no evident studies which intentionally reported that a failing of their study was to *not* involve the target population in the development stages. The admission of this failing when reporting findings from studies, however, could potentially give an indication of how similar studies might be enhanced in the future, to improve outcomes.

Sustainability is also a particularly important factor when considering the length of healthy eating interventions as there is evidence to suggest that sustained changes in the behaviour of the participants, and including positive changes to weight status, can occur over the short- to medium-term (Jones et al. 2011). There is less evidence however over the longer-term, for example, longer than 12 months duration (Jones et al. 2011). More evidence is needed to determine if behaviour change can be sustained in the longer-term, or if these changes at

short- or medium-term actually contribute to better health or quality of life improvements in the future, following the intervention (Jones et al. 2011). Further investment and funding opportunities need to be considered for the evaluation of long-term healthy eating interventions as they have the potential to achieve value for money and provide benefits in terms of Quality-Adjusted Life Years (QALYs) (Local Government Association 2013). In the 2013 report '*Money well spent? Assessing the cost effectiveness and return on investment of public health interventions*' (Local Government Association 2013) evidence was reviewed to assess effectiveness of public health interventions compared to standard treatment or no intervention at all. Approximately 89% of the interventions examined were found to be either cost-saving or good value for money and therefore presented a strong case for investment in interventions (Local Government Association 2013). Mass media healthy eating campaigns were included in this group, so investment in a local authority-led, school-based intervention such as CHANGE! has the potential to provide similar benefits to a population.

The evidence from this formative work was used to inform the material that was presented in the intervention teaching curriculum. It was decided by the research team that the areas for measurement relating to food should include a food intake study that used a questionnaire suitable for use by children at a population level, to give an indication of the types of foods that were being consumed during the study. It was also necessary to assess and measure the children's knowledge about food and nutrition as theoretically the scores for the intervention children for this aspect of the study, should display some improvement (and therefore hypothetically, an increase in knowledge) at post-intervention, following receipt of the teaching curriculum. The importance of assessing nutrition knowledge to combat obesity in children has been acknowledged in previous studies, (e.g. (Escalante-Guerrero et al. 2012). Lastly, a new questionnaire was designed and piloted to assess and measure the children's attitudes to eating and other eating habits and behaviours.

It is important to acknowledge that even small improvements in the diet can be nutritionally-significant (Paineau et al. 2010), even though the statistical analysis

did not demonstrate significant improvements in positive marker food intakes at post-intervention. It must also be considered that due to the complexity of eating behaviours, they are particularly difficult to change (Doak et al. 2006, Wang and Stewart 2012). For example, studies have found that knowledge about healthy and unhealthy eating does not necessarily transfer into modification of people's diets, nor does it automatically mean that people develop the skills with which to make those changes (Bullen and Benton 2004). For children this is especially important to consider as their food and drink choices, even in year 6, are governed by a 'nutritional gatekeeper' (Chadwick et al. 2013). It has been suggested that changes to food choices are possibly more likely to occur when children grow up in an environment where healthy eating and associated behaviours are the norm (such as schools), are modelled by the children's peers and principal adults in their lives, and are continually reinforced (Contento and Balch 1995). As discussed in chapter 1, historically when changes were made to the provision of food in schools, there was a demonstrable improvement in the health of the children (Walsh n.d.). This also demonstrates the potential that policy change at the Government level can have, and the influence it can have on children's health at the school level. This in theory would also demonstrate an effect in terms of lessening the burden on national health services.

The Foresight report (Butland et al. 2007) suggested that there are points in the life course of people where there are specific opportunities to influence behaviour. Between the ages of 5 to 11 years and 11 to 16 years, the children are developing food preferences and independent behaviours. CHANGE! was aimed at 10 to 11 year old children partly because of these developing independent behaviours and to help them make informed choices about foods as they grow older. The 'parenting' years (16 to 40 years of age) sees the development of new behaviours associated with child rearing (Butland et al. 2007). It was anticipated that CHANGE! could utilise these life course factors for future research so that any recognisable changes to behaviour for the children were supported by their peers and the principal adults in their lives. Additionally it was anticipated that these 'supporters' would receive appropriate reinforcement themselves. The role of parents' modelling healthy behaviours for their children has been known to be of importance for some time (Stevens 2010, Webber and Loescher 2013).

There are some positive outcomes from the study which will necessitate further investigation in the future. Whilst there were no substantial, documented improvements in the types of foods that the children reported consuming in the previous 24-hour period at the post-intervention collection point, their desire to demonstrate some intake of fruits and vegetables, albeit inconsistently, indicates that they are aware of the 'five-a-day' message and that it is socially desirable to consume fruits and vegetables as part of their diets. This finding of the study suggested that focusing on positive marker foods (rather than negative marker foods) and their association with desirable behaviours, could be an area for greater emphasis for future interventions.

All 4 to 6 year old children are currently entitled to a free piece of fruit or vegetable under the Government's School Fruit and Vegetable Scheme (Department for Education 2013e). One study recorded an increase of approximately 0.5 more portions that the children were consuming whilst they were eligible for the scheme (Ransley et al. 2007). Once the children were no longer eligible, their intakes returned to the baseline levels (Ransley et al. 2007). This data suggests that the children needed to be consistently provided with a fruit or vegetable portion for the behaviour to continue. Additionally when the children were no longer eligible for the scheme, the behaviour ceased. Despite the Government funding for the scheme coming under threat in 2007, the funding was still in place during the intervention period (2010-2011). Evidence from this scheme (e.g. (Ransley et al. 2007) demonstrated that continual exposure to particular foods and their availability is important if children are to turn these healthy behaviours into part of their everyday eating habits and therefore potentially influence their future health status. A commitment to funding this scheme on a whole-school basis, not just to Key Stage 1 children, will contribute to the Government's action plans for health, such as those found in 'Choosing Health' (Department of Health 2004) and 'Choose a Better Diet' (Department of Health 2005).

There was some improvement in the control group's diet score but a decrease in the score for the intervention group, at post-intervention, despite the intervention children being taught about healthy food choices as part of the teaching programme. It is difficult to specifically determine the reason for this but it can be

proposed that there was possibly either some effect of testing of the teaching curriculum such as pupils' fatigue and therefore performance on a task might decline (McBride 2013). Furthermore, the data collection tools were not sensitive enough to be able to capture the small subtle changes in the children's diets at each of the data collection points. It also indicated, however, that eating habits were influenced by factors other than whether the food was a healthy choice or not. Such factors include food preference, and environment, such as eating outside of the home and the types of food that were available to the children. The CHANGE! teaching programme addressed some of these factors such as how to select alternatives to some of the children's preferred high-fat-high-sugar foods, and how to do this outside the home environment. Although the CHANGE! data and current evidence shows that knowledge does not necessarily transfer into practice (Doak et al. 2006, Wang and Stewart 2012), constant reinforcing of healthy eating at the school level, in the wider community, and by government policy, should still be a priority. The recent introduction of the Universal Infant Free School Meals in primary schools and the inclusion of healthy eating lessons and practical cooking sessions in the Key Stage 2 curriculum, are both positive moves towards providing children with continuous exposure to the foods and skills necessary for a varied diet.

The total food knowledge scores all positively improved by post-intervention for both the control and intervention groups. Although the data analysis did statistically display some effect of the baseline data at post-intervention, it is difficult to determine why the increase occurred for both groups. The increase could possibly have come from their prior experience of the questionnaire from the baseline data collection, known as the 'testing effect' (McBride 2013). It describes an effect on subsequent test results when participants are tested more than once in a study (McBride 2013) and this could account for the increase in scores for both groups, and not just the intervention group.

The improvement in scores could also have occurred as a result of influences from outside of the control of the researchers, such as the children's exposure to the media. More importantly, there was theoretically some influence of the teaching curriculum on the intervention group's results, and therefore a potential

increase in awareness of healthy eating messages. There were also small improvements in their self-assessed ability to cook certain foods although it is difficult to say why this change happened without further research. What this finding does demonstrate is that if there had been a practical cooking element to the study, then there might have been further positive improvements in the scores for self-efficacy. This emphasises the importance of the introduction of practical cooking sessions into schools and the potential role they could have in improving children's diets. The concept of 'task self-efficacy' has been shown to improve healthy eating behaviours, particularly with fruits and vegetable consumption (Wall et al. 2012) and increases food acceptance, positive attitudes towards foods and consumption of more healthful foods (Anderson et al. 2002).

This is a timely and important finding from CHANGE! As well as the introduction of Universal Infant Free School Meals scheme and changes to the Design and Technology element of the curriculum, the Government has suggested that provision is made in the school timetable for PSHE-C (Department for Education 2013a). This was where the CHANGE! teaching curriculum was taught in the intervention schools. Additionally, in the National Curriculum at Key Stage 2 (which includes years 5 and 6) for Design and Technology it is stated that, "*pupils should develop their skills and the safe use of tools and equipment by undertaking a range of practical tasks, such as making products, maintenance or cooking."* (Department for Education 2013a)(p.159). It is proposed that the pupils should learn about what constitutes a balanced diet, including the role of different ingredients and how to make a healthy meal from them. Cooking skills are also a basic requirement as part of the curriculum for this age group (Department for Education 2013a). CHANGE! as a teaching programme would fulfil a majority of the criteria for this section of the National Curriculum. This means that if the original piloted version of the CHANGE! teaching programme was modified to include a practical cookery element, then this programme could prove to be a useful tool for the teachers to fulfil their teaching commitments to PSHE-C and Design and Technology at Key Stage 2, with the potential to be a recommended resource at local authority or even Government level.

It is essential that there is policy which links Government policy, including reference to the National Curriculum and Best Practice Guidance, such as 'Choosing Health' (Department of Health 2004), and improving food and nutrition behaviours in school children, by supporting and funding schemes such as the School Fruit and Vegetable Scheme and delivery of targeted interventions such as CHANGE! As the prevalence of obesity is currently around 25% of the UK population (Health and Social Care Information Centre 2013) there are significant economic costs associated with this, particularly to public health services (Health and Social Care Information Centre 2013). The relatively recent Government paper 'Healthy Lives, Healthy People' (HM Goverment 2010) discussed 'empowering' people to make changes to their behaviour and moving away from the idea of a 'nanny state.' If health-related interventions such as CHANGE! were appropriately funded, then there is the potential to reduce the prevalence of obesity in the future and thereby reducing some of the economic costs of obesity to the Government in terms of health and social care, over the longer-term (Butland et al. 2007).

Aspects of the Eating Attitudes Questionnaire displayed particular trends between baseline and post-intervention. It appeared that the children did not particularly respond to cues to eating, such as seeing food and wanting to eat it. Eating everything on their plate maintained its importance between the data collection points. This is an important finding because of the association between eating practices, particularly unhealthy ones, and the occurrence of overweight and obesity (Sharma 2006). CHANGE! addressed this in the intervention teaching curriculum by getting the intervention children to consider healthy snack choices such as carrot sticks, and how to make exchanges for unhealthy foods and drinks to healthier alternatives, such as swapping SSSD for water. Also, perceptions of portion size changed over the data collection period with portions more likely to contain '*just the right amount*' for the participants and less likely to have '*sometimes too much*', despite the evidence suggesting that children are less likely to be aware of what constitutes an appropriate sized portion for them (Frobisher and Maxwell 2003). A detailed study into children's ability to gauge portion size (Cornil et al. 2014) discussed that there was an improved visual sensitivity when portion sizes increased in those foods which were desirable to

the children but which were also perceived to be unhealthy at the same time, such as chocolate. There was also a tendency to underestimate food portion sizes as they increased in size. Other studies (e.g. (Vereecken et al. 2010)) have also demonstrated significant underestimations of portion sizes in this age group. This change in perceptions over the data collection period is, therefore, not supported by evidence in the literature and requires further investigation to determine why it occurred.

CHANGE!'s multi-dimensional approach to food intakes, food and nutrition knowledge and eating attitudes is consistent with the traditional educational approach which assesses outcomes in changes to dietary intakes, changes to knowledge, or changes to attitudes (Contento and Balch 1995). This is achieved by engaging the children in an intervention to increase their understanding of the broad nature of food, and to understand current food and nutrition issues, such as labelling. This means that they will hopefully develop the confidence and skills to have the ability to make food choices that will be of benefit to their health (Contento and Balch 1995) now and in the future.

6.2 Overarching issues

The study was designed with a whole population approach. All children could take part, with written consent and assent, without any specific exclusion criteria to consider. Unlike previous studies using the 'Planet Health' and 'Eat Well Keep Moving' texts (Gortmaker et al. 1999a, Gortmaker et al. 1999b, Kipping et al. 2010) the CHANGE! study did not specifically target overweight or obese children but all those children in the normal school population that consented to take part. The participants of CHANGE! were typical of an English year 6 population in terms of their prevalence of normal weight, overweight and obese, when compared to the NCMP data (National Obesity Observatory 2013b).

Whilst objective measures could be used to assess the anthropometric status of the participants, the lack of availability of appropriate questionnaires or other measurement tools to assess aspects of nutrition in the target population, did raise the importance of having the right tools to use to do this. The 24-hour recall food intake questionnaire (Johnson et al. 1999) was appropriate for use with a 10

to 11 year old population study, having previously been validity and reliability tested. The 'Cooking Kids' food knowledge questionnaire (Anderson et al. 2002) contained some types of foods which were not familiar to the CHANGE! children, such as lentils, and this may have affected their engagement with the quiz and subsequently the results achieved. Additionally there was no existing, tested tool which measured children's habitual attitudes to eating and therefore the researchers had to design one to be used specifically for this study. These issues highlight the need for appropriate, piloted and tested products to accurately measure the properties of food and nutrition associated with children. These tools need to be able to accurately measure the effect of this type of intervention so that they can be used to help to promote and support the importance of varied and balanced diets as part of a healthy lifestyle and encourage funding and investment in this area.

As reported earlier, changing eating behaviours in people is challenging (Doak et al. 2006) and particularly so in children. Eating habits are formed over a long period of time and are influenced by many factors such as environment, social setting, cultural norms and preference (Wang and Stewart 2012). It is safe to assume that the development of behaviours over time, into habits, will similarly take an indeterminate amount of time to change into improved or changed habits. When school-based nutrition-focused interventions have been conducted, the length of the data collection periods has varied (see chapter 2). There have been varying degrees of success with these interventions but where changes to diets have been recorded, for example, the APPLES multidisciplinary programme (Sahota et al. 2001), the programmes were conducted over a whole academic school year. Studies have highlighted the necessity to have intervention programmes that last for at least one academic school year and that have a long-term follow-up and include an evaluation stage at the end (Wang and Stewart 2012). This study fulfilled two of these criteria but it would have benefitted from a longer follow-up period, to determine any sustained changes to habits or knowledge after an appropriate period of time following post-intervention.

6.3 Implications for childhood health

Studies have shown that the outcomes of some adverse health characteristics in adulthood can be traced back to childhood (Buttriss 2005, Reilly et al. 2003). These include obesity, hypertension and hyperlipidaemia. Whilst there are many inter-related factors which can contribute to the development of these conditions, evidence has shown that diet has an important role. It is after all, the one behaviour which humans have to be engaged in every day for survival (Baranowski 2004).

In order to understand what influences the food choice decisions that people make every day, research using interventions such as CHANGE! are important to acknowledge and assess the viewpoints of the participants. The research needs to be based on a theoretical framework in order for this information to be utilised so that appropriate methods of intervention can be developed which take into account indicators of health literacy (Nutbeam 1998) and allow for the participation of the client in the development process, so that an intervention is likely to be more sustainable and successful for the target participants (Cole and Horacek 2009, Lean et al. 2007). Investment into promotion of healthy lifestyles at both a Government level and at the local level is therefore essential in order to achieve this.

Investment at the school-level will be of paramount importance if children are to be targeted by this healthy lifestyles promotion. The National Curriculum (2013) with its aim of giving the Key Stage 2 children the opportunity to learn how to prepare and cook foods, is a prime example of where investment is needed. Many schools do not have the facilities in which to do a practical cooking session and potentially many school children will be disadvantaged because of this. The Department for Education's (2013) guidance states that schools may have to '*adapt what they teach according to the facilities available*' which means that the delivery of cooking will either be facilitated as intended in those few schools who *do* have resources, have a reduced delivery for this part of the curriculum using unsuitable facilities, or it will not be delivered at all.

In addition to the economic issues which schools face, other barriers which the schools might face in trying to implement food preparation and cooking into the curriculum, include available teaching staff to facilitate these cooking sessions, including when incorporated as part of an intervention teaching curriculum such as CHANGE! Staff are needed who are confident in their delivery of this type of subject matter and it needs to be given priority in an already busy academic curriculum. This issue was highlighted in an evaluation of the Chefs Adopt A School (CAAS) Scheme (Caraher et al. 2013). Whilst there were certainly some positive outcomes of the programme, such as the children enjoyed tasting new foods and learning and practicing new food preparation skills, the chefs tended to highlight what was of interest to them during the sessions and even gave inconsistent messages about healthy eating (Caraher et al. 2013). This finding emphasised the need for appropriate staffing if cooking and nutrition sessions are to be introduced into schools as part of the curriculum or as part of an intervention. Caraher et al. (2013) stated the need for the formal involvement of a dietitian and/or a home economist in such schemes.

The literacy levels of the children also have to be taken into account so that any teaching programme is inclusive, even to those children who may not be able to read, even in year 6. The lowest literacy levels are associated with the poorest pupils and their families (McCoy 2011) and so the inclusion of a resource such as the CHANGE! curriculum might be a way to try and engage those families that are harder to reach about healthy lifestyles, with the use of activities which are appropriate to a variety of literacy levels and show consideration for the socio-economic statuses of the target population.

CHANGE! was developed, using formative, qualitative research to describe and involve the target population in the development of CHANGE!, followed by an intervention period where quantitative data was collected, to assess the effectiveness of the teaching programme in the intervention schools. The CHANGE! intervention displayed partial effectiveness with the participants due to some of the outcomes discussed in chapter 5 and earlier in this chapter, such as the acknowledgment of the requirement of, and the social desirability to consume fruits and vegetables, and the increase in total food knowledge. The challenge

for future research is how to turn these positive outcomes into progressive, sustained behaviour change, so that the children are contributing to improved health statuses for themselves now, and for their future adult-selves. In order for this to happen, the success of future interventions should encompass Government policy and funding linked with academic research to provide rigour and reliability to the outcomes of long-term funded interventions and schemes.

6.4 Limitations of the study

Improvements to the tools used during the data collection would have potentially recorded an increased effectiveness of the intervention. The food intake questionnaire had previously been successfully used to measure 24-hour food recall in 10 to 11 year old children (Boddy et al. 2013, Johnson and Hackett 1997). It is a record, however, of an individual's food intake for one day at one period of time in a week, month and year, and therefore might not be indicative of a person's typical eating habits.

The food knowledge questionnaire (Anderson et al. 2002) had been used previously as a stand-alone questionnaire for a study in the North East of England, and therefore geographical and cultural differences occurred in terms of the lack of familiarity of the CHANGE! participants with specific foods on the questionnaire, such as lentils. Previous studies assessing food and/or nutrition knowledge of differing populations, suggest that *ad hoc* measures of knowledge, typically lack any psychometric validation (Wardle et al. 2000) and therefore there is a reduced statistical power for the measuring tool to detect any associations with other variables (Wardle et al. 2000).

The Eating Attitudes Questionnaire was a novel tool specifically developed for the CHANGE! study due to the lack of an existing and appropriate measuring tool. Until further validation and reliability work can be carried out on this questionnaire, the data collected can only be used to establish any trends in the children's responses. For future studies utilising the CHANGE! teaching curriculum, appropriate tools need to be developed, piloted and validity and reliability tested to ensure that they are consistently recording data from all participants.

There were also some limitations in the delivery of the intervention teaching curriculum itself in the schools. The teachers in the intervention schools were asked by the researchers to deliver the intervention teaching curriculum within the 20-week 'intervention period' of Monday 1st November 2010 through to Friday 1st April 2011, following an initial training session. There was no formal monitoring of the teachers' progress with the teaching programme. Consequently when the teachers gave feedback about the programme post-intervention, it transpired that the delivery of the lessons and the number of lessons completed, varied from school to school: for example, one school reported having completed all twenty lessons in the allocated time, whilst another reported having only completed about ten of the lessons. These inconsistencies in the delivery of the teaching programme could therefore realistically have impacted on the results obtained. If the intervention teaching programme was to be repeated in the future, regular monitoring of the teachers' progress would need to be included as part of the process, so that the sessions would be implemented as the researchers planned. This is known as 'fidelity' (Contento et al. 2002) and would ensure that all intervention children were receiving the same experience. This finding post-intervention also identified that although the teachers appreciated being able to have a flexible approach to teaching the CHANGE! curriculum, in order for the aims of the curriculum to be met and fidelity to be achieved, then the choice of facilitator of the teaching sessions formed an important part of the success of the programme. This could also ultimately impact on the outcomes of the study.

With the current National Curriculum guidance (Department for Education 2013a) proposing that PSHE-C be timetabled in every primary school, and food and nutrition to be an inherent part of that, there is a danger that introducing healthy eating interventions such as CHANGE! into the curriculum, means that it becomes a 'tick-box' exercise for the schools. Despite evidence recommending schools as ideal places in which to teach and inform children about healthy eating (Kelishadi and Azizi-Soleiman 2014, Sbruzzi et al. 2013, Waters et al. 2011) it is possible that the delivery of interventions needs to become more formal; that is, use the agency supplying the intervention to also deliver the intervention programme to ensure fidelity. Whilst there would be a cost implication for this

(and a cost-effectiveness analysis would be important), it means that during the intervention pilot study period, any evidence collected throughout will be comparable with other schools because they have all had the same delivery. It would potentially be easier to distinguish which aspects of the intervention were more successful and which aspects were not. Appropriate or novel tools could also be piloted at the same time, alongside the existing measures. When applying for funding, bids would need to take this factor into account.

In addition to some of the delivery problems, the teachers also fed back that they would have preferred to have the intervention teaching programme in year 5, rather than year 6. This was mainly due to the time pressures elicited on the year 6 teachers and the year 6 curriculum, by the Standard Assessment Tests (SATS) curriculum. The CHANGE! teaching programme was aimed at 10 to 11 year old children, taking their development stage and educational needs into account. There is scope to adapt it for use with 9 to 10 year old children instead, so this would not be a barrier to extending the use of the CHANGE! curriculum.

6.5 Summary and conclusions

To summarise, the main aim of this research was to develop, pilot and evaluate a healthy eating intervention for year 6 children in the UK. This thesis approached this by using the PRECEDE-PROCEED planning framework on which to base the study. This model allowed for formative work in the form of focus groups and interviews with the children participants (see appendix 9.5 and 9.8), their families and teachers to inform Phase 2 of the study; the intervention period. A novel teaching curriculum was developed for a UK audience from an existing US programme and this was delivered in the participating intervention schools.

Food intakes, food and nutrition knowledge, and attitudes to eating were investigated with varying levels of success. Some findings, discussed in chapters 5 and 6, require further investigation to determine their potential as markers when making assessments of dietary changes. What is noteworthy, however, is that some of the more important findings from the study, such as the increased self-assessed ability to make certain foods, that there was an increase in total food knowledge scores, and that the highest mean scores were from the children who

lived in areas of lower deprivation, support the use of interventions such as CHANGE! at the school-level. These results could potentially be the starting point for some children to start questioning the types of food they are habitually eating and maybe looking to make small changes to their behaviours, as even small changes can be nutritionally significant in the longer-term.

There is a need for sustainable interventions, particularly in the school setting, to target unhealthy eating practices in children, as indicated by the evidence (Kelishadi and Azizi-Soleiman 2014, Sbruzzi et al. 2013, Waters et al. 2011). This needs to be at a school-level, embedded as part of the school curriculum, which targets the whole population including the parents and families of the school-aged children. The intervention should be allied with the National Curriculum to provide schools with an academic, research-led tool that they can utilise. For the researchers, accurate and reliable tools are needed to measure the outcomes of these interventions and to predict where future research needs to be focused. CHANGE! as a healthy eating teaching resource, has the potential to do this.

Chapter 7

Recommendations for future work

7. Recommendations for future research

The findings of the study and its limitations have highlighted a number of recommendations for further investigation within CHANGE!:

1. Further development, piloting, validity and reliability testing of measurement tools for increased accuracy and reliability in the knowledge and eating attitudes aspects of the study.

2. Year 5 children (9 to 10 years old) may benefit more from the intervention curriculum than year 6 children (10 to 11 years old). This would be so that the fidelity of the curriculum is not hindered by other aspects of the school curriculum such as SATS.

3. The teaching programme would benefit from increased involvement of the family in the process, so that parents could motivate and positively encourage their children's food choices. There would need to be an initial programme of study which investigated the needs and concerns of the parents as to how they might achieve this, with activities based around these requirements.

4. Continual monitoring of the progress of the delivery of the intervention teaching programme in the intervention schools should be built into the process to ensure fidelity.

5. The study would benefit from a qualitative investigation, conducted at post-intervention or at the follow-up stages of the research. This would provide additional information and supporting statements to some of the quantitative studies' findings. It would provide additional data about, for example, why the control children were adding sugar to foods, why there was an increased self-assessed ability with cooking certain foods, and what they thought about the amount of food that is on their plates at mealtimes.

Recommendations for the future of improving UK children's diets:

1. Use of mixed methods research during data collection to get 'maximum value' (Swift and Tischler 2010) from the research and to determine what is important to the participants before and after an intervention.

2. Further development, piloting, validity and reliability testing of measurement tools for increased accuracy and reliability when data collecting with child participants. This is so that not only can food-related behaviours be measured as intakes or to assess changes, for instance, but so that they can be used to potentially *predict* factors that influence behaviours.

3. A longer follow-up period is needed to assess any long term and sustained impact that an intervention has had. This needs to be built into the study research schedule and be appropriately funded.

4. The role of the family appears to be important in making changes to eating behaviours, through the use of role models, influencing nutritional gatekeepers and the importance of eating occasions as a family. This idea of using the parents as 'models' of behaviour for their children, is in line with evidence from the Foresight report (Butland et al. 2007).

5. Engagement of those children and families with the lowest levels of literacy by appropriate use of activities, so that they have access to facilities in order to achieve this and are empowered to make small changes to their health behaviours.

6. Teachers and school staff should be supported to act as role models for healthy eating behaviours throughout the school day.

7. Perpetuation of the School Fruit and Vegetable Scheme so that the whole school population has access to at least one portion of fruit or vegetables per day.

8. The Government needs to commit to investment in facilities and equipment in all primary schools so that they are able to provide cooking facilities for the children to fully meet the National Curriculum's aims for food and nutrition in 'Design and Technology' at Key Stage 2.

9. The Government needs to set realistic targets to assess changes in the prevalence of obesity. A long-term follow-up to an intervention study is necessary due to the challenging and longitudinal nature of changing eating behaviours and habits. This needs to be reflected in the funding for such interventions.

Chapter 8
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Chapter 9

Appendices

Appendix 9.1: Ethical approval

From: Williams, Mandy
To: Boddy, Lynne; Fairclough, Stuart
Subject: Amendment to Ethical approval
Date: 26 May 2011 14:41:43

-

CHANGE! (Children's Health, Activity and Nutrition: Get Educated!) 10/ECL/039

Liverpool John Moores University Research Ethics Committee (REC) has reviewed the above notification of major amendments by Chair's action. I am happy to inform you that the Committee are content to give a favourable ethical opinion and recruitment to the study can now commence.

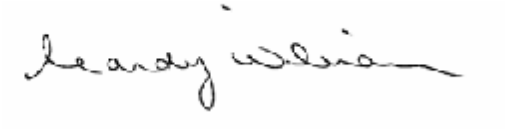
Approval is given on the understanding that:

- any adverse reactions/events which take place during the course of the project will be reported to the Committee immediately;
- any unforeseen ethical issues arising during the course of the project will be reported to the Committee immediately;
- any substantive amendments to the protocol will be reported to the Committee immediately.
- the LJMU logo is used for all documentation relating to participant recruitment and participation eg poster, information sheets, consent forms, questionnaires. The JMU logo can be accessed at www.ljmu.ac.uk/images/jmulogo

For details on how to report adverse events or amendments please refer to the information provided at http://www.ljmu.ac.uk/RGSO/RGSO_Docs/EC8Adverse.pdf

Please note that ethical approval is given for a period of five years from the date that the original approval was granted and therefore the expiry date for this project will be June 2010 An application for extension of approval must be submitted if the project continues after this date.

Yours sincerely
PP:



Brian Kerrigan
Chair of the LJMU REC
Tel: 0151 904 6467
E-mail:a.f.williams@ljmu.ac.uk
CC: Supervisor

Appendix 9.2: Participant recruitment information sheet

LIVERPOOL JOHN MOORES UNIVERSITY
CHILD PARTICIPANT
INFORMATION SHEET

Title of Project: CHANGE! (Children's Health, Activity and Nutrition: Get Educated!)

Name of Researchers and School/Faculty: *Dr. Stuart Fairclough, Dr. Lynne Boddy, Dr. Ian Davies, Dr. Allan Hackett, Rebecca Gobbi, Genevieve Warburton, Kelly Mackintosh (The Faculty of Education, Community and Leisure, Liverpool John Moores University).*

You are being invited to take part in a research project. Before you decide it is important that you understand why the research is being done and what it involves. Please take time to read the following information. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you want to take part.

1. What is the purpose of the study?
In Wigan there are lots of opportunities for children to take part in physical activity and sport, and activities that encourage healthy eating. Being active and eating well is important because it is good for our health.

The purpose of this project is to improve eating habits and physical activity of Year 6 pupils and their families in Wigan. The project will also try and find out what children think about their own physical activity and eating habits. The information collected will help us to learn how well the sport, physical activity and healthy eating programmes in Wigan are working.

2. **Do I have to take part?**
No. It is up to you to decide whether or not to take part. If you do you will be asked to sign the assent form. You are still free to drop out at any time and without giving a reason, and we will stop taking any measures or asking you to fill out any questionnaires as soon as you tell us you want to stop. Dropping out will not affect your school or sporting opportunities in any way.

3. What will happen to me if I take part?
If you decide to take part you will be asked to fill in questionnaires, asking about the types of physical activities you do, what you think about your own physical activity, how often you take part in physical activity, and aspects of your eating habits. A researcher will explain how to fill in each questionnaire and will be there whilst you complete them, in case you need to ask about anything you are not sure of.

- We will measure everyone's weight, height, sitting height, blood pressure, the distance around your waist and hips and look at how much muscle and fat you have in your body. All of these measures will take place away from the rest of the group, and no one but the researchers will see the results.

- Weight will be measured by asking you to stand on some weighing scales with your shoes taken off.

- Height and sitting height will be measured using a height meter; you will be asked to stand and then sit with your back to the height meter and the researcher will record your standing and sitting height.

- Blood pressure will be measured by placing a cuff around your arm which will squeeze your arm for a few seconds before releasing again.

- The distance around your waist and hips will be measured using a measuring tape.

- We will look at how much muscle, fat and water is in your body using a special type of scales. You will stand on the scales with your bare feet and it will give us a reading. We won't show any of your results to anyone else.

- We will also do a fitness session, where we will ask you to complete a shuttle run test.

- Completing the questionnaires and having the measurements taken should take no longer than two hours. All of these measures will take place at school in school time. Your class teacher will be there along with the researchers who will do the measurements with you.

- To measure your physical activity we will ask you to wear an activity monitor attached to an elastic belt around your waist. These monitors measure and record how much activity you do and are a bit like pedometers.

- We would like you to wear them for 7 days. You put them on when you get up on a morning and take them off when you go to bed. You also need to take the monitor off when doing any activities where they might get wet, like swimming, showering, taking a bath, etc. After 7 days the researchers will be at school to collect the monitors back from you. If you are happy for us to do so, we will send either your parent/guardian or yourself a message each day of the physical activity monitoring to remind you to wear it and to bring it back to school after seven days.

- We will also be looking at the types of foods you and your family like to eat and see how much you know about foods. To do this we will ask you to fill in a couple of short questionnaires in school.

4. Will my taking part in the study be kept private?

All of the results of the research will only be viewed by the researchers. We will write reports about the project, but this will only give general information about your year group as a whole. At no time will your name be used when we write any of the results.

For more information or if you have any questions please contact one of the researchers:

Rebecca Gobbi (R.Gobbi@2009.ljmu.ac.uk)
Kelly Mackintosh (K.A.Mackintosh@2009.ljmu.ac.uk)
Genevieve Warburton (G.L.Warburton@2009.ljmu.ac.uk)
Address: Liverpool John Moores University, IM Marsh, Barkhill Rd, Liverpool, L17 6BD
Phone: **0151 231 5271**

LIVERPOOL JOHN MOORES UNIVERSITY
CHILD PARTICIPANT
ADDITIONAL MEASUREMENTS
INFORMATION SHEET

Title of Project: CHANGE! (Children's Health, Activity and Nutrition: Get Educated!)

Name of Researchers and School/Faculty:
Dr Stuart Fairclough, Dr. Lynne Boddy, Dr. Allan Hackett, Dr. Ian Davies (Faculty of Education, Community and Leisure).

We would like to take some additional measurements from 5 children from each school. We will be randomly picking 5 names from those who want to take part. Before you decide if you want to be included it is important that you understand why the research is being done and what it involves. Please take time to read the following information. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you want to take part.

1. Why are we doing this study?
We are interested in children's health, physical activity and eating behaviours. We would like to go into a bit more detail with these additional tests, and we've invited some children to take part in this part of the project.

2. **Do I have to take part?**
No. It is up to you to decide whether or not to take part. If you do you will be given this information sheet and asked to sign a consent form. You are still free to drop out at any time and without giving a reason. We will stop taking any measurements or doing any tests straight away when you tell us you want to stop. Dropping out will not affect your schooling or sporting opportunities in any way.

3. What will happen if you take part?
You will be invited to take part on 2 different testing days. Throughout these days you will take part in these activities and tests:-

Testing Day A: In School

Markers of heart and blood vessel health

It is important to have a healthy heart and healthy blood vessels. Blood vessels are things like arteries and veins that carry the blood pumped by your heart around your body.
This test and the heart and blood vessel scans will help us see how healthy your heart and arteries are. Make sure you haven't eaten anything on the morning of the blood test, you can drink water though. We will do this test at your school in an area we set up to take blood samples. We will give you some breakfast afterwards. During this test a researcher will take tiny bit of blood from your finger tip. The researcher will explain to you what will happen and how you will feel. Researchers will make sure you are feeling OK and you can ask them questions whenever you like. After you have relaxed and had your breakfast you will go back to class. Remember, you don't have to do this test, and if you choose not to that is fine.

Testing Day B: Lab Measures

DEXA whole body scan

You will be invited into the university to take part in a body scan. This machine will scan your body, giving us a picture of your skeleton. The scan takes four minutes and you will be asked to lie as still as possible. You won't feel the scan at all, and researchers will explain the test when you are in the lab and answer any questions you have.

1. Ultrasound: Pictures of your heart and arteries

In these tests we will look at pictures of your heart and some of your blood vessels- we will show you these pictures during the testing. For one of the tests we will put a cuff around your arm that will fill full of air and become tight around your arm. This will then be deflated and become loose again and we will look at pictures to see how a blood vessel in your arm changes. We will also check your blood pressure. The researchers will talk you through the tests when you are in the lab and answer any questions you have.

2. Running on a Treadmill to look at fitness

We will ask you to walk and then run on a treadmill (running machine) until you are running as fast as you can. You will wear a harness around your waist so you can't fall off the treadmill, and you will wear a face mask and a monitor that will tell us how fast your heart is beating. We will give you lots of encouragement to keep on running.

After School Skills Session

When you return to school after the lab visit you will stay at school for an hour and in this session we will ask you to do a number of skills, including hopping and throwing.

4. Other Details:

3. Sports Kit

You should wear clean lightweight kit for the testing. Trainers should be non-muddy.

4. Time

Blood tests will be done at your school and taking the blood will only take a few seconds, then you will eat your breakfast and return to class to complete the other measurements with the rest of the class. The lab based testing will take up one day, and you will be picked up from school and taken back to school. Your parents/guardians are welcome to come with you to the lab based testing.

Eating

Make sure you don't eat on the morning of the blood test, but you can drink water. We will give you some breakfast after your blood test but you should bring a packed lunch and drinks to lab testing sessions.

If you want to take part in these additional measurements please circle YES in the last question on the assent form, if you do not want to take part in these additional measurements but still want to take part in the rest of the study then please make sure you circle NO to the last question. If you are selected we will let you know before any of the testing days.

For more information or if you have any questions please contact one of the researchers:
Rebecca Gobbi (R.Gobbi@2009.ljmu.ac.uk);
Kelly Mackintosh (K.A.Mackintosh@2009.ljmu.ac.uk);
Genevieve Warburton (G.L.Warburton@2009.ljmu.ac.uk)
Address: Liverpool John Moores University, IM Marsh, Barkhill Rd, Liverpool, L17 6BD
Phone: **0151 231 5271**

Appendix 9.3: Participant consent form

LIVERPOOL JOHN MOORES UNIVERSITY
PARENTAL/GUARDIAN/ CARER
CONSENT FORM 1

Project Name: *CHANGE!*

Researchers*: Dr. Stuart Fairclough, Dr. Lynne Boddy, Dr. Ian Davies, Dr. Allan Hackett, Rebecca Gobbi, Genevieve Warburton, Kelly Mackintosh.*
The Faculty of Education, Community and Leisure, Liverpool John Moores University

5.	I confirm that I have read and understand the information provided for the above study. I have had the opportunity to consider the information, ask questions and if I have asked questions these have been answered satisfactorily.	1
6.	I understand that my child's participation is voluntary and that my child is free to withdraw at any time, without giving a reason and that this will not affect mine or my child's legal rights.	2
7.	I understand that any personal information collected during the study will be anonymised and remain confidential.	3
8.	I give permission for photographs/video to be taken of my child during the project, which may be used for subsequent academic/promotional purposes associated with LJMU, Wigan Council and Ashton, Leigh and Wigan PCT.	4
9.	I give permission for the research team to ask my child for his/her mobile number for the sole purpose of sending text message reminders to wear the physical activity monitors.	5
10.	I agree my child can take part in the above study.	6

Name of Participant _____

Parent/Guardian/Carer Signature_____Date_____

Appendix 9.4: Participant assent form

LIVERPOOL JOHN MOORES UNIVERSITY
ASSENT FORM FOR CHILDREN

Project Name: *CHANGE!*

Researchers*: Dr. Stuart Fairclough, Dr. Lynne Boddy, Dr. Ian Davies, Dr. Allan Hackett, Rebecca Gobbi, Genevieve Warburton, Kelly Mackintosh.*
The Faculty of Education, Community and Leisure, Liverpool John Moores University

To be completed by the child participant: Please circle your answer to the questions below.

Have you read (or had read to you) information about this project?	Yes/No
Do you understand what this project is about?	Yes/No
Have you asked all the questions you want?	Yes/No
Have you had your questions answered in a way you understand?	Yes/No
Do you understand it's OK to stop taking part at any time?	Yes/No
Are you happy to give your mobile phone number to the researchers, so we can remind you to wear your physical activity monitor?	Yes/No
Are you happy to take part?	Yes/No
Do you want to take part (if chosen) for the additional measurements? (blood sample and lab visit day)	***Yes/No***

If you **don't** want to take part, don't sign your name!

If you do want to take part, please write your name below

Your name _____

Date _____

Appendix 9.5: Focus group questions

WELCOME
Good morning/afternoon

First of all, thank you all for agreeing to meet with me and do a group interview.

I've just put the recorders in the middle – this is just so that I have a record of it (my memories rubbish), but don't worry, it's only those of us working on the project who will have access to it.

Ok, before we start, I'd like to get to know you all a bit and make sure we all know each other's' names. So let's go round the group quickly and introduce yourself and say what you'd like to be when you grow up. I'll go first! My name's Kelly and I'd like to be a Doctor.

OVERVIEW OF THE TOPIC

I'm interested in children's health and what you do in your spare time. Today we're going to be discussing what we all think 'health' is, and how our 'eating habits' and how 'physically active' we are can affect it. It's important to know that there are no right or wrong answers; it's just a little chat about your opinions, which may be different to others in the group. This should last for about half an hour, so the more you chat the quicker it will go ☺

GROUND RULES

I'd like to try to encourage you all to speak one at a time.

HEALTH

We're going to start off by talking about *HEALTH… So,*

- Can anyone tell me what they think *HEALTH* means?
- What do you think you can do to stay *HEALTHY?*
    - Which *foods* help you to stay healthy?
    - Why do you think you should have a healthy diet?
    -
- If someone had an UNHEALTHY HEART, how do you think it would affect their life?

Ok, so the next topic is ***EATING HABITS***…

- What does it feel like when you feel hungry? *Describe how you feel…*
    - Now imagine you've just eaten a meal, describe how you feel
        - *Full, full to bursting, still hungry, hot, sick etc*

- What things make you want to eat?
    - *Adverts, smells, boredom, loneliness, upset, happy etc*

- Describe a normal mealtime with your family *to me*
    - *Who cooks, where is the meal eaten, who is present at the meal, what is eaten, first to finish etc*

- Ok, so now describe what your ideal meal time would be like…
    - *The food, eating the food, being with the family, watching the TV etc*

- What kind of foods can you have for school dinners?
    - What would you like to have?

- Would you like to learn to cook? Why/Why not?

Ok, so let's move onto the next topic… ***PHYSICAL ACTIVITY****…*

- Firstly, who can tell me what PA is?
- What PA do you do? Why/Why not?

  What facilities do you use? *Where do you go, do you use the swimming pool, soccer dome etc.*

- If you could do any PA, what would you do? Why?
    - What things stop you from doing PA? *Time, parents, friends etc.*

- What do you do at playtime?
- Where do you like to play out of school?
    - What places can you play outside?

    - What clubs do you go to, either in or out of school? *E.g., brownies may do activities*

- What activities do you do as a family?
    - What activities would you *like* to do as a family?

Ok, the last topic area is ***GOALS***… Imagine you had to set yourself a goal…

- What would encourage you to reach a set goal?

- Who would be the person to encourage you to reach a set goal?

- Whose support would you like if you had to set yourself a goal?

- If you have been good, how do you get rewarded by your parents or teachers?
    - *What type of treats?*
    - *Food treats?*
    - *Extra TV?*

- If you had to be like anyone famous, who would it be? Why?
- If you had to be like anyone, who would it be? Why?

ROUND UP

Ok, we'll have to round up this discussion now. Is there anything anyone would like to add, something they think I've missed?

Thank you all for participating.

Appendix 9.6: Schedule of data collection

Appendix 9.6: Schedule of data collection for CHANGE!

KEY: **CONTROL**; **INTERVENTION**

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
BASELINE	**October 4** MG	**5** AB	**6** HSM	**7** OL	**8** SG
	11 RLH	**12** SC	**13** SG labs	**14** AB labs	**15** OL labs
	18 MG labs	**19** SC labs	**20** HSM labs	**21** School hols	**22** School hols
	25 School hols	**26** School hols	**27** School hols	**28** School hols	**29** School hols
	Nov 1 NW labs	**2** RLH labs	**3** SL labs	**4** RLH bloods only	**5** HF labs
	8 ON labs	**9**	**10** NW	**11** ON	**12** HF
	15	**16** SL	**17** OH	**18** OH labs	
POST-INTERVENTION	**February 28**	**March 1** RLH	**2** HF labs	**3** NW	**4** HF
	7	**8** ON	**9** SL	**10** OH	**11** OH labs
	14 ON labs	**15** NW labs	**16** SL labs	**17** RLH labs	**18**
	21 MG	**22** SG	**23** OL	**24** AB	**25** HSM
	28	**29** SG labs	**30** OL labs	**31** MG labs	**April 1** HSM labs
	4	**5** AB labs			
FOLLOW-UP	**May 16** RLH	**17** NW	**18** SL	**19** ON (June 9th for labs)	**20** HF
	23 RLH labs	**24** NW labs	**25** HF labs	**26** OH labs	**27** SL labs
	30 School hols	**31** School hols	**June 1** School hols	**2** School hols	**3** School hols
	6 OH	**7** HSM & MG labs	**8** SG labs	**9** OL & **ON** labs	**10** AB labs
	13 HSM	**14** MG	**15** SG	**16** AB	**17** OL

Appendix 9.7: Nutrition questionnaires

NUTRITION QUESTIONNAIRES

Please fill in this page before you begin the rest of the questionnaire.

School: (*please write the name of your school on the line below*)

_____

Today's date (*e.g. 08/03/2011*) ____ / ____ / **2011**

Are you a boy or a girl? Boy ☐ Girl ☐

Surname (*last name*)

_____

First name

_____

Your date of birth (e.g. 30/10/2000) ____ / ____/ _____

Your home postcode (e.g. WN2 1PE) _____

[Please turn over]

FOOD INTAKE QUESTIONS

Please read all the questions carefully.

There are no right or wrong answers but it is important that you answer all the questions and answer them as best you can.

Please put an X in the square using BLACK INK as shown here ☒

Before answering the questions please take two minutes to think about the food you ate yesterday.

Your answers will only be seen by the CHANGE! research team and will remain private and confidential.

Your diet – what did you eat and drink YESTERDAY?

1. Breakfast time: Did you

a. Eat anything at breakfast time yesterday? Yes ☐ No ☐
b. Drink anything at breakfast time yesterday? Yes ☐ No ☐
c. Eat anything on your way to school yesterday? Yes ☐ No ☐
d. Drink anything on your way to school yesterday? Yes ☐ No ☐

2. Lunch time: Did you

a. Eat a school lunch yesterday? Yes ☐ No ☐
b. Bring a packed lunch from home yesterday? Yes ☐ No ☐
c. Go home for lunch yesterday? Yes ☐ No ☐

3. Did you, at any time yesterday, eat any amount of breakfast cereals?

a. Any sugared cereals
(e.g. Frosties, Ricicles, Coco Pops, Crunchy Nut)? Yes ☐ No ☐
b. Any high fibre cereals
(e.g. Bran Flakes, Weetabix, All Bran, Special K,
Sultana Bran, Fruit and Fibre, Shredded Wheat)? Yes ☐ No ☐
c. Any oat based cereals (e.g. muesli, porridge, Readybrek)? Yes ☐ No ☐
d. Any other non-sugary cereals (e.g. Rice Krispies,
Cornflakes, Puffed Wheat, Puffa Puffa Rice)? Yes ☐ No ☐

4. Did you, at any time yesterday, eat any amount of bread?

a. White bread (slices, toast or buns)? Yes ☐ No ☐
b. Brown or wholemeal (slices, toast or buns)? Yes ☐ No ☐

5. Did you, at any time yesterday, eat any amount of butter or margarine?

a. Butter (e.g. Lurpak, Anchor, Utterly Butterly)? Yes ☐ No ☐
b. Hard margarine (e.g. Stork, Echo, etc.)? Yes ☐ No ☐
c. Ordinary soft margarine (e.g. Blue Band, Summer County)? Yes ☐ No ☐
d. Polyunsaturated soft margarine (e.g. Flora, Vitalite, Olivio, Benecol, Flora Proactive)? Yes ☐ No ☐
e. Low fat margarine (e.g. Outline, Delight, Gold, Vitalite Lite)? Yes ☐ No ☐

6. Did you, at any time yesterday, eat any amount of biscuits?

a. Plain biscuits (e.g. malted milk, Digestive, Rich Tea etc.)? Yes ☐ No ☐
b. Biscuits covered in chocolate (e.g. Kit Kat, Penguin, Club, Rocky, etc.)? Yes ☐ No ☐

7. Did you, at any time yesterday, eat any amount of cakes and puddings?

a. Cakes (e.g. swiss roll, doughnuts, scones, pastry/pies, jam/custard tarts, etc.)? Yes ☐ No ☐
b. Puddings (e.g. fruit pie, sponge pudding, tinned fruit, jelly, trifle, lemon meringue, cheesecake, milk pudding, etc.)? Yes ☐ No ☐

8. Did you, at any time yesterday, eat any amount of sweets and chocolates?

a. Boiled sweets, fruit gums, pastilles, liquorice, jelly sweets, chews, toffees, chewing gum? Yes ☐ No ☐
b. Chocolates or chocolate bars (e.g. Twirl, Dairy Milk, Mars Bar, Twix, etc.)? Yes ☐ No ☐
c. Ice cream, choc-ices, ice-lollies? Yes ☐ No ☐

9. Did you, at any time yesterday, eat any amount of sugar?

a. Sugar (white/brown) in any drinks (e.g. tea, coffee, cocoa etc.)? Yes ☐ No ☐
b. Sugar (white/brown) on any foods (e.g. breakfast cereals, pancakes, etc.)? Yes ☐ No ☐
c. Artificial sweetener (e.g. Saccharin, Sweetex, etc.)? Yes ☐ No ☐

10. Did you, at any time yesterday, eat any amount of potatoes?

a. Boiled potatoes? Yes ☐ No ☐
b. Mashed potato? Yes ☐ No ☐
c. Baked or jacket potatoes? Yes ☐ No ☐
d. Roast potatoes? Yes ☐ No ☐
e. Chips? Yes ☐ No ☐
f. Crisps (any type or flavour)? Yes ☐ No ☐

11. Did you, at any time yesterday, eat any amount of fresh fruit (not tinned)?

a. Apples, oranges, pears, bananas, plums, strawberries, etc. Yes ☐ No ☐

12. Did you, at any time yesterday, eat any amount of vegetables?

a. Baked beans? Yes ☐ No ☐
b. Any type of salad (e.g. tomatoes, lettuce, cucumber, celery, etc.)? Yes ☐ No ☐
c. Fried vegetables (e.g. fried onion, fried mushroom, etc.)? Yes ☐ No ☐
d. Any other vegetables, fresh, frozen or tinned (e.g. peas, cabbage, carrots, green beans, parsnips, tinned tomatoes, cauliflower, leeks, turnips, sprouts, etc.)? Yes ☐ No ☐

13. Did you, at any time yesterday, eat any amount of meat?

a. Ordinary burgers? Yes ☐ No ☐
b. Ordinary sausages? Yes ☐ No ☐
c. Low fat burgers? Yes ☐ No ☐
d. Low fat sausages? Yes ☐ No ☐
e. Meat pies, Cornish pasties, sausage rolls, etc.? Yes ☐ No ☐
f. Any other type of meat (e.g. mince, steak, ham, chicken, etc.)? Yes ☐ No ☐

14. Did you, at any time yesterday, eat any amount of fish?

a. Fish fried in batter? Yes ☐ No ☐
b. Any other types of fish (e.g. tinned tuna, fish fingers, etc.)? Yes ☐ No ☐

15. Did you, at any time yesterday, eat any amount of cheese?

a. Ordinary cheese (e.g. Cheddar, Leicester, Cheshire, etc.)? Yes ☐ No ☐
b. Soft cheese (e.g. Philadelphia, Dairylea, Primula, Laughing Cow, etc.)? Yes ☐ No ☐
c. Low fat cheese (e.g. Shape, Philadelphia Lite, etc.)? Yes ☐ No ☐

16. Did you, at any time yesterday, eat any take away foods?

a. Chip shop food, Chinese, Indian, pizza, etc? Yes ☐ No ☐

17. Did you, at any time yesterday, put any salt on your food? Yes ☐ No ☐

18. Did you, at any time yesterday, drink any amount of fizzy drinks?

a. Ordinary fizzy drinks or Soda Stream (e.g. Coca-Cola, Pepsi, 7-Up, Sprite, Fanta, etc.)? Yes ☐ No ☐
b. Diet fizzy drinks or Soda Stream (e.g. Coca-Cola, Pepsi, 7-Up, Sprite, Fanta, etc.)? Yes ☐ No ☐

19. Did you, at any time yesterday, drink any amount of still cordials? (Drinks you can add water to e.g. orange squash, Ribena, Vimto, etc.)

a. Regular? Yes ☐ No ☐

b. Diet or low calorie? Yes ☐ No ☐

20. Did you, at any time yesterday, drink any amount of milk (including milk in tea, coffee, milkshakes, flavoured milk, cocoa, or on breakfast cereals)?

a. Full fat milk? Yes ☐ No ☐

b. Skimmed or semi-skimmed milk? Yes ☐ No ☐

21. Did you, at any time yesterday, drink any amount of water? Yes ☐ No ☐

22. Do you have a free school meal? Yes ☐ No ☐

23. How many portions (about a handful e.g. 1 apple, 1 banana, a handful of strawberries) of fruit did you eat yesterday?

This includes fresh fruit like apples, bananas, oranges, strawberries, and tinned or cooked fruit such as tinned peaches, stewed apple, apple pie etc, concentrated or freshly squeezed fruit juices.

0 ◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5 ◯ 6 ◯ 7 ◯ 8 ◯ 9+ ◯

24. How many portions (about a handful) of vegetables (EXCLUDING POTATOES) and salad did you eat yesterday?

This includes fresh, tinned or frozen vegetables like peas (any type), beans (any type such as green, baked, etc.) sprouts, carrots, cauliflower, broccoli, mushrooms, sweet corn, tomatoes (any type such as fresh, cherry or tinned). Salad might include: tomatoes, lettuce, coleslaw, cucumber, and this counts as one portion.

0 ◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5 ◯ 6 ◯ 7 ◯ 8 ◯ 9+ ◯

25. What time do you usually get out of bed (during the week)?

(Put a 'X' in one box only)

Before 6.29 a.m. ☐
6.30-6.59 a.m. ☐
7.00-7.29 a.m. ☐
7.30-7.59 a.m. ☐
After 8.00 a.m. ☐

26. What time do you usually go to bed (during the week)?
(Put a 'X' in one box only)

Before 8.00 p.m. ☐
8.00-8.59 p.m. ☐
9.00-10.00 p.m. ☐
After 10.00 p.m. ☐

FOOD KNOWLEDGE QUESTIONS

FOOD PREPARATION AND COOKING

Use the space below each question to write in your answers to the following questions. Or if you don't know, tick the box which says 'don't know'.

Look at this example first:
***EXAMPLE: what are the main ingredients used to make cheese sauce?**

cheese	milk	flour	margarine	seasoning	Don't know

Now you fill in the answers to these questions:

1. What are the **3** main ingredients needed to make coleslaw?

			Don't know

2. What are the **4** main ingredients needed to make lentil soup?

				Don't know

3. What are the **3** main ingredients needed to make bread?

			Don't know

4. What are the **4** main ingredients needed to make an apple crumble?

				Don't know

5. Tick **one** box for each of the following foods to show how long you think each would take to cook

	Up to 15 minutes	**More than 15 minutes**
Vegetable stir fry		
Broccoli		
Pasta shells (not quick cook) in water that is boiling		
White rice (not easy cook)		
Boiled potatoes		

6. How would you rate your ability to make the following foods from beginning to end? (Not opening a packet or tub!)
   Tick one box for each recipe listed.

   I can make…

	all by myself	**with a little help**	**with a lot of help**	**not at all**
Vegetable stir fry				
Coleslaw				
Boiled potatoes				
Lentil soup				
Apple crumble				
Boiled rice				
Pasta e.g. shells, macaroni				
Bread				
Broccoli				

NUTRITION KNOWLEDGE

Read each question carefully before trying to answer it.
Please tick one box only.

7. In general, how many portions of fruit and vegetables are recommended by health experts to be eaten every day?

   1 or less ☐
   2 or 3 ☐
   4 ☐
   5 or more ☐
   Not sure ☐

8. Which **one** of the following items would be the **healthiest** one to take as a between meals snack?

   A plain digestive biscuit ☐
   A carton of low sugar Ribena ☐
   A kiwi fruit ☐
   A muesli bar, e.g. Tracker ☐
   Not sure ☐

9. Choose the **healthiest** sandwich filling from the list below.

   Cheddar cheese and onion ☐
   Bacon and tomato sauce ☐
   Chicken, lettuce and tomato ☐
   Egg mayonnaise ☐
   Not sure ☐

10. Which **one** of the following breakfast type foods would be the **healthiest** choice?

    One fried sausage ☐
    One slice of bread ☐
    One fried egg ☐
    One Pop Tart ☐
    Not sure ☐

11. Out of the following types of cooked potato options which **one** is the **healthiest** choice?

One medium portion of roast potatoes	☐
One medium portion of chips	☐
One baked potato (no filling)	☐
One medium serving of potatoes mashed with butter	☐
Not sure	☐

12. Which one of the choices below would **NOT** be a good example of a **healthy** snack?

One bowl of cereal	☐
One plate of spaghetti	☐
One small bag of dry roast peanuts	☐
One bread roll	☐
Not sure	☐

13. Which sandwich is **healthier**?

Two *thin* slices of bread and a *thick* slice of cheese	☐
Two *thick* slices of bread and a *thin* slice of cheese	☐
One *thick* slice of bread and a *thick* slice of cheese	☐
All the same	☐
Not sure	☐

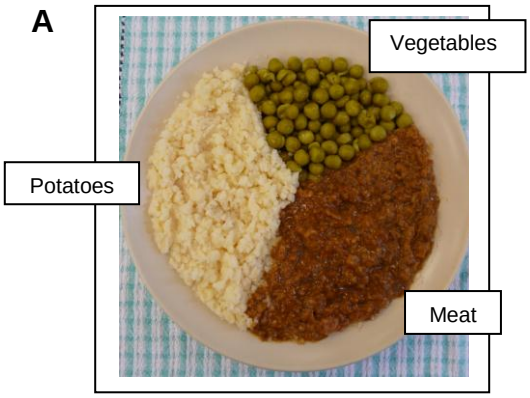
14. People trying **healthier eating** are in general recommended by the health experts to eat more of which of the following foods?
Tick all that apply.

	Tick box
Bread (brown, white and wholemeal)	
Cheddar cheese	
Baked beans	
Chips	
Butter	
Bananas	
Cakes and pastries	
Meat pies	
Baked potatoes (without filling)	
Breakfast cereal	

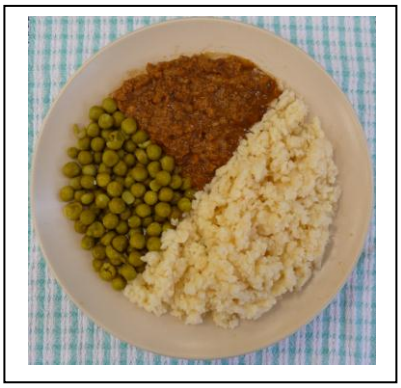
15. A main meal can sometimes be made up of foods such as potatoes, meat and vegetables. Which one of the plates shows the **healthiest** plate of foods?

Circle one only – A, B or C (or D if you are not sure)

A



B



C

D Don't know

EATING ATTITUDE QUESTIONS

*Please tick **one** answer only per question.*

1. I usually finish eating before everyone else.

☐Never

☐Not often

☐Sometimes

☐Almost always

☐Always

2. I think it is important to eat everything on my plate at meals.

☐Not at all important

☐Not very important

☐Makes no difference

☐A little important

☐Very important

3. I usually think that there's too much food on my plate.

☐There's always too much

☐There's sometimes too much

☐There's just the right amount for me

☐There's sometimes not quite enough

☐There's always not enough

4. I like trying foods that I haven't eaten before.

☐Never

☐Not often

☐Sometimes

☐Almost always

☐Always

5. If I see food I want to eat it.

☐Never

☐Not often

☐Sometimes

☐Almost always

☐Always

[Please turn over]

6. My favourite foods are always in the house.

☐Never

☐Not often

☐Sometimes

☐Almost always

☐Always

7. I can help myself to any foods in the house I want.

☐Never

☐Not often

☐Sometimes

☐Almost always

☐Always

8. When I'm eating, I'm often doing something else at the same time.

☐Never *(go to question 10)*

☐Not often *(go to question 10)*

☐Sometimes *(go to question 9)*

☐Almost always *(go to question 9)*

☐Always *(go to question 9)*

9. What are you most likely to be doing? *(write your answer on the line below)*

_____

10. I have to eat some foods I don't like, so that I can have foods I enjoy, like pudding.

☐Never

☐Not often

☐Sometimes

☐Almost always

☐Always

11. My favourite treat is a food.

☐Agree a lot

☐Agree slightly

☐Don't know

☐Disagree slightly

☐Disagree a lot

12. My favourite treat which is a food is:
(*Write the name of your favourite treat food on the line*):

_____

Thank you for completing this questionnaire

CHANGE!

CHILDREN'S HEALTH, ACTIVITY AND NUTRITION:
GET EDUCATED!

Appendix 9.8: Publications

Fairclough, S. J. Hackett, A. F. Davies, I. G. Gobbi, R. Mackintosh, K. A. Warburton, G. L. Stratton, G. van Sluijs, E. M. F. and Boddy, L. M. (2013) Promoting healthy weight in primary school children through physical activity and nutrition education: a pragmatic evaluation of the CHANGE! randomised intervention study. *BMC Public Health.* 13, 626.

Boddy, L. M. Knowles, Z. R. Davies, I. G. Warburton, G. L. Mackintosh, K. A. Houghton, L. and Fairclough, S. J. (2012) Using formative research to develop the healthy eating component of the CHANGE! school-based curriculum intervention. *BMC Public Health.* 12, 710.

Gobbi, R. M. Davies, I. G. Fairclough, S. J. Mackintosh, K. A. Warburton, G. L. Stratton, G. George, K. P. Hackett, A. F. and Boddy, L. M. (2012) Clustered cardiometabolic risk, cardiorespiratory fitness and physical activity n 10-11 year-old children. The CHANGE! Project baseline. *Archives of Exercise in Health and Disease.* 3 (3), 207-213.

Conference proceedings publications

Warburton, G. L. Mahon, E. Davies, I. G. Gobbi, R. Mackintosh, K. Fairclough, S. J. and J. C. Abayomi, J. C. (2014) Food knowledge and IMD score of Year 6 children participating in the CHANGE! Project. *Proceedings of the Nutrition Society*. 73, (OCE2), E109.

Warburton, G. L. Mahon, E. Davies, I. G. Gobbi, R. Mackintosh, K. Fairclough, S. J. and Abayomi, J. C. (2013) BMI status of children in the CHANGE! Project and its association with the consumption of 'positive marker' and 'negative marker' foods. *Proceedings of the Nutrition Society*. 72, (OCE3), E145.

Warburton, G. L. Abayomi, J. C. Mahon, E. Gobbi, R. Mackintosh, K. Fairclough, S. J. Boddy, L. M. George, K. and Davies, I. G. (2012) Comparison of the reported intakes of fruits and vegetables in Year 6 children: The CHANGE! Project. *Proceedings of the Nutrition Society*. 71, (OCE3), E227.

Warburton, G. L. Abayomi, J. C. Mahon, E. and Hackett, A. F. (2011) Eating attitudes of children may affect over eating and contribute to obesity. *Proceedings of the Nutrition Society*. 70, (OCE3), E81.