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Author(s): Aine Coogan

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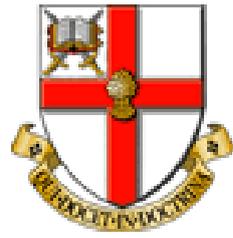
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PAPER 1
LITERATURE REVIEW

1.1 Literature Review Abstract

The health, social and economic implications of childhood obesity are well documented (Lobstein, Baur & Uauy, 2004). However, little effective action has been taken to address the childhood obesity epidemic. The global concern over the rising prevalence of overweight and obesity has been the focus of research and debate over the past three decades.

Feasible and sustainable approaches to prevent further increases in childhood overweight and obesity, to date, have remained mostly elusive. Conversely, there is a consensus regarding the role of the living environment as a determinant of obesity. Recent research provides strong evidence of the importance of living environments as determinants of obesity (Rosenkranz & Dzewaltowski, 2008; Kumanyika, Parker & Sims, 2010).

As a result, it is essential to explore and assess practical family based interventions that are effective to understand the parental influences that may contribute to the development of childhood obesity.

1.2 Literature Review Paper

1.2.1 Introduction

Historically, a heavy child meant a healthy child and the concept, “bigger is better” was widely accepted. Today, this perception might not have changed for some, with research indicating that the rates of childhood obesity have risen in recent decades. Recent statistics from the World Health Organization (WHO) reported that the worldwide prevalence of childhood obesity has increased from 4.2% in 1990 to 6.7% in 2010. This trend is expected to reach 9.1% or 60 million in 2020 (Han, Lawlor & Kimm, 2010; Onis, Blo, & Orghi, 2010). The International Obesity Taskforce’s review of obesity in children and young people has estimated that at least 155 million school age children worldwide are overweight or obese, representing one in ten of all children (Lobstein, Baur & Uauy, 2004).

In Ireland, the National Taskforce on Obesity (2005) suggested that the number of overweight children has trebled over the previous decade, with the number increasing by 10,000 annually. The most recent Irish results come from the WHO European Childhood Obesity Surveillance Initiative (2011) cited by Department of Health and Children (2011) which found that 13% of 7 year old boys were overweight, with a further 5% obese; while 19% of girls were overweight, with a further 7% obese. In summary almost one-quarter of 7 year old Irish children are either overweight or obese.

Daniels (2006) predicts that the current generation will be the first to live shorter lives than their parents. Childhood obesity has major implications for the child,

the health service and the health of the nation. The effects of childhood obesity include early onset of type two diabetes, cardiovascular disease and asthma as well as social and economic disadvantage (Reilly et al., 2003). To date, feasible and sustainable approaches to prevent further increases in childhood overweight and obesity have remained mostly elusive. Conversely, there is a consensus regarding the role of the family environment as a determinant of obesity. In recent years, research has suggested that home and family environments are essential in the development of food preferences and energy intake beliefs (Rosenkranz & Dzewaltowski, 2008). As a result, it is essential to develop, explore, assess and disseminate practical family based interventions that are effective.

As there is limited Irish-based evidence on the effectiveness of multi-component interventions targeting childhood obesity, this review will explore family based interventions currently taking place in the United Kingdom (U.K.). This review endeavours to enhance the understanding of this treatment efficacy approach to childhood obesity management which can then be transferred to an Irish setting.

1.2.2 Irish childhood obesity epidemic

Over the past thirty years, regardless of public health warnings, there is evidence that childhood obesity has reached epidemic proportions (Lobstein, Baur & Uauy, 2004). In Ireland, of particular concern is the increasing obesity prevalence among young children aged eight to 12 years.

Figure 1 illustrates that in Ireland between 1990 and 2005 the number of overweight boys increased from five percent to 12% and the numbers of girls classified as obese almost tripled from five percent to 14%.

Figure 1 Percentages of boys and girls aged eight to 12 years with body weight classified as overweight and obese in 1990 and 2005

Source: Irish Universities Nutrition Alliance. (2005). Body weight and eating habits in five -12 year old Irish children. The National Children's Food Survey. p17

The trends between 1990 and 2005 showed a significant ($p \leq 0.05$) increase in childhood obesity, identifying a two-to-fourfold increase in obesity in all children aged eight-12 years. Furthermore O' Neill et al. (2007) made comparisons to the National Nutrition Survey (1948) where mean height and weight data was recorded on 14,835 primary school children. The comparisons identified that adiposity in children aged eight-12 years had steadily risen over the 57 years outlined. In order to further ascertain trends from this National data, O' Neill et

al. (2007) used the mean height, weight and BMI of 8-12 year old children. The data was plotted from the National Nutrition Survey (NNS) 1948, Irish National Nutrition Survey (INNS) 1990 and National Children's Food Survey (NCFS) 2005 as a percentage increase since 1948. This rise in obesity over the past 50 years can be observed in Figure 2.

Figure 2 Percentage change in mean weight, height and BMI relative to 1948 for Irish children aged 8-12 years. Source: O'Neill et al. (2007). Prevalence of overweight and obesity in Irish school children, using four Different definitions. European journal of clinical nutrition. p 748

As illustrated in figure 2, mean weight and mean height increased in a linear manner, with only a slight increase in mean height. This identifies an increase in adiposity over the last 57 years as body weight has increased at a much more

dramatic rate than height or BMI since 1948. However, it is important to note that the sampling criteria differ between 1948 and the 1990 and 2005 surveys.

The Growing Up in Ireland Report (2011) identifies further increases stating that obesity in Irish children is higher than many northern European countries with 19% of Irish children overweight at age nine. These findings highlight the increase in childhood obesity in Ireland since 1974, and the greater increase since 1990.

The surveys discussed highlight the future consequences for the health of the Irish nation and it can be projected that childhood obesity prevalence will continue to increase unless effective interventions are put in place. Conversely, Han et al. (2010) suggests this prevalence of childhood obesity might be abating in some developing countries due to the response of intervention programmes put in place over the past number of years to tackle this issue. The statistics outlined identify that this is not yet the case in Ireland. There is an urgent need to prioritise the effective management of childhood obesity in Ireland. If left unaddressed, more children are likely to become overweight and obese in early adulthood, leading to an increased risk of long term health consequences.

1.2.3 Addressing the complexity of childhood obesity in children aged 8-12 years

The causes of obesity are complex and multifactorial with diet, environment, epigenetics and genetics all playing a role (Foresight Report, 2007). For this reason, childhood obesity is not fully understood. Consequently addressing the issue is difficult. In response to the issue, the Minister for Health and Children

appointed a National Taskforce on Obesity in Ireland in 2004. The aim of the Taskforce was to review the obesity trends in Ireland and make health promoting policy recommendations designed to address these unfavourable trends. The Taskforce Report (2005) provided 93 recommendations but many of these recommendations have not been converted into action. Having a policy to tackle obesity will be ineffective unless sufficient resources are allocated for implementation. Share and Strain (2008) indicate that the Taskforce Report (2005) distances the government from direct involvement in change. The broad recommendations for government action fall short of the targeted practical action that the Taskforce set out as its agenda. There seems to be a lack of government recognition that the increase in childhood obesity prevalence in Ireland is a threat to National re-development. Since the introduction of The National Taskforce on Obesity (2005) the number of overweight children is still increasing by 10 000 annually.

The WHO state that overweight and obesity is a condition characterised by the accumulation of excess body fat or adipose tissue, resulting in disturbances in health (WHO Obesity and Overweight Factsheet, 2013). The ecological theory identifies that multiple systems operating at different levels contribute to the increase in the quantity of fat cells that attribute to the development of obesity (Koplan, Kraak & Liverman, 2005). Although the causes of obesity are complex due to the multiple systems operating at different levels, there is a consensus regarding the role of the family as a determinant of obesity. In recent years, research has suggested that home and family environments are essential in the development of food preferences and energy intake beliefs, identifying the

child's microsystem as the context for developing specific behaviours (Rosenkranz & Dziewaltowski, 2008). In addition, Bronfenbrenner (2005) elicits that parents and family members are the most influential part of the ecology in childhood development. In light of this, the concept of an 'obesogenic environment' within the home has been identified as a significant factor in the development of childhood obesity.

Results from a review by Luttikhuis et al. (2009) found that only 28% of the interventions demonstrated beneficial effects for treating obesity in children from baseline to the end of intervention. Additionally, the review provided emerging evidence that the most effective interventions combined dietary, physical activity, a behavioural component and parental involvement.

However, translating this evidence into practice is challenging. Guidance from the National Institute for Health and Clinical Excellence (NICE) recommends that core elements of any intervention for childhood obesity should combine nutritional education, behaviour modification and promotion of physical activity (NICE 2006). Given the complexity of childhood obesity, management interventions ideally should address not only the physiology of energy balance, food intake and energy expenditure, but also the influences of the micro- and macro-environment.

1.2.4 Dietary Intake

Nutrition transition as a result of urbanisation and increased wealth has been considered as the major cause of the obesity epidemic. Swinburn et al. (2011)

identify that the variance in obesity prevalence in populations is due to how the food systems interact with the environmental factors. Numerous studies have documented a marked change in energy intake worldwide. Swinburn, Sacks and Ravussin (2009) conducted research for the European Association for the Study of Obesity and concluded that the key factor in the rise in child obesity in America since the 1970's was increased energy intake. The study suggests that children need to reduce their caloric intake by around 350 kilocalories a day to return to the average weights of the 1970's. The National Food Consumption Survey data cited by Nielsen and Popkin (2003) indicates that American children increased their energy intake by almost 200 calories per day from the period 1989-1991 to 1994-1996. Abete, Astrup, Martínez, Thorsdottir and Zulet (2010) concur and state that the control of food intake is one of the most important factors in the involvement of successful dietary treatment. It is difficult to make evidence-based dietary recommendations for child weight management as details of successful dietary interventions are lacking.

The "food pyramid" has been used as the basis for healthy eating advice in Ireland for nearly 20 years. These nutritional guidelines focus on ensuring that nutritional intake is adequate. However, these guidelines might not be practical to ensure appropriate energy intakes for sedentary lifestyles or for those who are all ready overweight or obese, as servings of food types were interchangeable. In light of this, The Report of the National Task Force on Obesity (2005) recommended that Ireland's healthy eating guidelines be reviewed and updated as they were too general. The new comprehensive food

pyramid and healthy eating guidelines was launched in 2012. While the revised food pyramid can be used as a guide for children and it states portion size per age, its failure to address primary and secondary prevention independently may hinder the potential for its effectiveness.

Although it may be clear that the accumulation of surplus calories resulting from today's 'obesogenic' environment shapes children's tendency to consume too many calories, inconsistency exists about the relative role of overconsumption and physical inactivity in the childhood obesity epidemic. The National Health and Nutrition Examination Survey (NHANES) have contradicted claims that increases in energy intake are responsible for the obesity epidemic. NHANES data from 1970 to 1994 cited by Troiano, Briefel, Carroll & Bialostosky (2000) suggests that calorie consumption has remained steady or may have even declined in America over past few decades. In the U.K. the National Food Survey (2013) is showing similar trends with household food consumption reporting a general decline since the 1960's. However, it is important to note that food intake data is subject to reporting error, particularly among children, which may explain the different research findings regarding total caloric intake.

These dietary changes outlined are compounded by lifestyle changes that foster a reduction in physical activity. The Young Hearts Study in Northern Ireland (2002) identified that both increased energy intake and decreased physical activity are crucial to childhood obesity. Hence, obesity is caused by a chronic energy imbalance involving both dietary intake and physical activity patterns.

1.2.5 Physical Activity

Physical activity is an important factor in addressing childhood obesity as energy expenditure is potentially modifiable (Metcalf, Hosking, Jeffery, Voss, Henley & Wilkin, 2011). Being active throughout our daily lives and across the life cycle is important in terms of human development, health outcomes and economic productivity. In addition, effects of exercise are known to extend beyond the physiological benefits and are also associated with increased self-confidence and social connectedness (Strauss, Rodzilsky, Burack & Colin, 2001). Consequently physical inactivity among children is a serious concern, as children who spend significant amounts of time in sedentary states are exposed to becoming overweight. In a 4-year longitudinal study Fulton, Dai, Steffen, Grunbaum and Labarthe (2009) moderate-to-vigorous physical activity at baseline was found to be inversely related to positive changes in BMI. Similar observations were determined by ten-year study among girls by Kimm et al. (2005) that found a decrease in physical activity and not in total energy intake was associated with an increase in the girls' BMI.

The Centers for Disease Control and Prevention (2008) recommended that children in the United State of America (U.S.A.) partake in 60 minutes of physical activity a day consisting of moderate to vigorous aerobic activity and both muscle and bone strengthening activities. Moderate to vigorous intensity is classified as at least 3.0 metabolic equivalents (METs) such as walking at 3.0 miles per hour (Pate et al., 1995). Similarly, the National Guidelines for Physical Activity in Ireland (2009) state that all children and young people aged 2-18 years should be active, at a moderate to vigorous level, for at least 60 minutes

every day. This includes muscle-strengthening, flexibility and bone-strengthening exercises three times a week. Critically physical activity, which is half of the energy balance equation, is the volitional component of energy expenditure yet the guidelines have not identified the optimal amount of physical activity necessary to prevent obesity.

Durnin (1992) estimated that children's energy expenditure may have fallen by up to 700 kilocalories a day over the previous 50 years. The National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (2008) recorded the activity levels of 800 American children using accelerometers. From their data, it was found that physical activity declines dramatically across age groups with only 42% of children aged 6-11 years obtained the 60 min a day of physical activity. Additionally, a study of seven- to nine-year-old Dublin children identified that; 14% of boys and 24% of girls were not sufficiently active for the time required to benefit the cardiovascular system (Hussey, Gormley & Bell, 2001).

Although the outlined studies and statistics may suggest that children are becoming increasingly sedentary, there is a lack of longitudinal research that objectively measures physical activity levels. For this reason it is difficult to make inference regarding secular trends.

1.2.6 The Family

Thus far, the childhood obesity studies outlined predominately address the physiology of energy balance; the food intake and energy expenditure.

However, it is the relationship between the child's characteristics and childhood obesity that is likely to be moderated by their parents' behaviours (Zeller & Daniels, 2004). For this reason it is imperative to also research the influences of the micro and macro environment and the child's activity environment. The home environment has been acknowledged as one that can either facilitate or inhibit a healthy diet and physical activity (Golan & Weizman, 2001; Golan, 2004; Rosenkranz & Dzewaltowski, 2008).

Luttikhuis et al. (2009) provide evidence that supports interventions that are family-based and multidisciplinary including diet, physical activity and behaviour change. Parental obesity increases the risk of a child becoming obese. The 'Growing up in Ireland' report (2009) also found children's weight and obesity were strongly linked to that of their parents. The study identified where both parents were overweight or obese, 33% of children were also overweight or obese; in comparison with 11% of children where neither parent was overweight or obese. This may be due to the child assuming a sedentary lifestyle and poor quality of diet, similar to their parent, which sets a pattern of an obesogenic lifestyle (Caroli & Lagravinese, 2002).

For children under the age of 12 years, the home environment has been suggested as critical for providing access to healthy food and physical activity opportunities (Kumanyika, Parker, & Sims, 2010). Ventura and Birch (2008) indicate that parental influence is crucial as the selection of children's food types and control of energy intake are largely shaped by the parents or guardians at this age.

Consequently, parents are considered to play a key role in the development of a child's lifestyle behaviours and as a result require appropriate advice and support to make the necessary lifestyle changes for their family.

Munsch et al. (2008) identified that family-targeted behavioural lifestyle interventions targeting children less than twelve years of age showed a decrease in body mass index (BMI) more than standard care at a six month follow up, however the effect size was small. The social and physical environment that children encounter at home is often counterproductive to promoting healthy eating and physically active lifestyles. Golan and Weizman (2001) developed a conceptual model based in social ecological theory, as a framework to guide the treatment of childhood obesity. This model highlights the parent as the most influential environmental variable regarding a child's weight. Research completed by Sato et al. (2011) identified that the only independent predictor of study participants experiencing a reduction in BMI was the parent themselves experiencing a reduction in BMI. For this reason, healthy lifestyle modelling by the parent is a key component in determining the child's own treatment outcome. This suggests that it is essential to target the first system which children are exposed to, the family microsystem. Consequently, it is imperative to understand the parental influences that contribute to the development of childhood obesity.

1.2.7 Current Evidence of the effectiveness of family based interventions

In contrast to the Irish context, preventing the increasing prevalence of childhood obesity in U.K. has been recognised as a public health priority. As a result the U.K. government has a stated intention to 'reverse the rising tide of obesity and overweight individuals in the population by ensuring that everyone is able to achieve and maintain a healthy weight'. By 2020, the U.K. government aims to reduce the number of overweight and obese children to 2000 levels by working with children under eleven years old (Healthy Weight, Healthy Lives: A Cross Government Strategy for England, 2008).

The Scottish Intercollegiate Guidelines Network (SIGN) (2010) recommend that treatment interventions for managing childhood obesity should include behaviour change components, be family-based, to engage at least one parent and aim to change the whole family unit's lifestyle. International recommendations agree that the core elements of any initiative to address childhood obesity should involve the whole family while also including nutrition education, promotion of physical activity and behaviour modification (Luttikhuis et al, 2009; NICE, 2006). However there is no published Irish-based evidence on the effectiveness of multi-component family based interventions targeting childhood obesity.

For this reason U.K. family based interventions studies will be reviewed. The U.K. was chosen due its similar contextual influences to Ireland. Interventions were reviewed if they reported primary outcomes of height and weight,

presented a baseline and a post-intervention measurement. To account for sex and age-related changes over time, body mass index standard deviation score (BMI SDs or BMI-Z-score) must have been reported. Interventions were excluded if they did not include children aged 8-12 years; did not report BMI, weight or nutritional status or did not assess parental and/or parenting factors. This search presented three reviews of the 'MEND' (Mind, Exercise, Nutrition, Do it) 7-13 programme, three published evaluations of the 'WATCH IT!' programme and the Dept of Health West Midlands (2009) regional evaluation of weight management programmes for children and families. Overall, the outcomes of the following six family intervention programmes will be discussed; 'MEND', 'Fitter Families', 'Fun4Life', 'One Body One Life' (OBOL), 'WATCH IT!' and the 'YW8' programme. All the programmes were based either on NICE guidelines or theories of behaviour change and offered both nutritional advice and exercise classes.

The studies varied in intervention design, outcome measurements and methodological quality. Most studies demonstrated beneficial effects of interventions on child adiposity from baseline to the end of the intervention. The key findings from each intervention are outlined in table 1.

This review identified that over half of all children participating in the interventions either maintained or lost weight in three programmes. However, a significant change ($p < 0.001$) in participant weight was only observed in the 'MEND' programme.

At the six month assessment, BMI scores were found to be statistically significant in the 'YW8' programme ($p < 0.001$) and the MEND programmes ($p < 0.001$) when compared to the pre assessment measurements. However, it must be noted that weight loss for children is not always the best indicator of change in weight status as there will be a growth in height. For this reason BMI standard deviation (SD) is a better indicator of weight change in children. The 'WATCH IT!' programme and the 'MEND' programmes also had a significant reduction in BMI SDs of $p < 0.005$ and $p < 0.001$ respectively.

The 'MEND' programme identified a significant reduction in BMI z-score (-0.24 ; $P < 0.0001$) when compared to its control group (Sacher et al., 2010). These results compare favourably with Luttikhuis et al. (2009), who found the average reduction of BMI z-scores to be 0.06 for childhood obesity interventions. As a result the 'MEND' intervention produced four times the average decrease in BMI z-scores.

Table 1 Pre and Post Interventions Outcomes

Programme Name	Inclusion Criteria	Pre - intervention mean weight(kg)	Post-intervention mean weight(kg)	Pre-intervention mean BMI	Post-intervention mean BMI	Pre - intervention mean BMI SD	Post-intervention mean BMI SD	Pre-Intervention waist circumference(cm)	Post-Intervention waist circumference(cm)	Retention Rate at the end of the intervention % (n)
MEND	7-12 years Overweight or obese Adult family member to attend	62.2	61.3	28.3	27.4	2.9	2.7	89.3	87	59.8(239)
Fun4Life	8-16 years Overweight or obese Includes family members	66.9	67.3	29	28.9	2.9	2.9	91.9	91.1	52 (45)
Fitter Families	6-16 years Overweight or obese Adult family member to attend	67.7	67.6	29.5	32.2	3.1	3.1	Data not available	Data not available	89(40)
YW8?	8-13 years >91st Centile Adult family member to attend	67.1	66.4	29.2	28.4	2.9	2.8	Data not available	Data not available	66 (46)
Watch It! (Bronze Level)	8-11 years >98 th Centile Adult family member to attend Registered with a GP in area	Data not available	Data not available	28.5	28.8	3.0	2.9	87.5	88.0	32.9(53)
OBOL	Someone in family has a weight problems (under or over normal weight)	50.2	50.4	23.6	23.2	2.2	2.1	78.0	80.1	

As excess abdominal fat in children is associated with several cardiovascular disease risk factors, reducing waist circumference in children is advocated. Waist circumference was found to be significantly reduced in the 'OBOL' programme ($p < 0.001$) and the 'MEND' programme ($p < 0.001$).

Regarding physical activity significant improvement in cardiovascular fitness were reported by participants in the 'WATCH IT!' and the 'MEND' interventions. However, testing between interventions differs and as a result comparisons cannot be made between those interventions. The 'MEND' programme found a significant decrease ($p < 0.001$) in mean heart rate using YMCA fitness test. The 'Watch It!' programme identified a significant increase in cardiovascular fitness ($p < 0.001$) using the 3 minute step test. However, the 'WATCH IT!' intervention and the MEND intervention were the only two programmes to have a significant reduction in children's BMI SDs. This reinforces the fact that physical activity is the volitional component of energy expenditure and concurs with the findings from Fulton, Dai, Steffen, Grunbaum and Labarthe (2009) that physical activity was found to be inversely related to positive changes in BMI. It is important to also note that fitness testing was stated as being too time consuming by the interventions that did not yield significant health related outcomes.

Regarding parental involvement, all interventions required at least one parent to be involved, however, interventions varied on whether the whole family were included. The Fun4Life, Fitter families and YW8 interventions all actively encouraged the whole family to attend. The 'MEND' and the 'WATCH IT!' programmes required a parent to attend the educational session, but not the

physical activities sessions. Twiddy, Wilson, Bryant and Rudolf (2012) state that one way of improving the child's likelihood of weight management success in the 'WATCH IT!' programme is to support overweight parents to make their own successful lifestyle changes may be. This is concurrent with the findings from Sato et al. (2011) who identified that the only independent predictor of children experiencing a reduction in BMI was the parent themselves experiencing a reduction in BMI. However, there is limited data available on parental physical activity levels pre and post intervention for all programmes. Therefore associations between child BMI and parental physical activity levels cannot be inference.

The OBOL intervention differs from the other interventions included as it had the most inclusive approach, aiming to recruit whole families. Data was available for 87 parents who had attended the OBOL intervention during the evaluation period (Department of Health, 2009). The results found that both weight and BMI decreased across the intervention for the parents, by 0.4Kg and 0.2 points respectively. Parent's waist circumference showed a significant change, decreasing by 1.9cm. A similar significant reduction ($p < 0.001$) in waist circumference was recorded for the children participating the 'OBOL' programme. This result supports the findings by Zeller and Daniels (2004) and Golan and Weizman (2001) whom highlighted the parent as the most influential environmental variable regarding a child's weight. Regrettably the 'OBOL' programme did not outline the associations between parent and child weight change.

Due to differences in data collection and recording across the interventions discussed, it is only possible to only yield weak inferences. Currently, there is no method that is considered the 'gold standard' for the assessment of overall physical activity or dietary intake in childhood weight management interventions. Self-report tools remain the most cost-effective and practical option for evaluating weight management interventions. However, changes in food intake and exercise should be measured in a systematic and standardised way to allow the findings to be critically evaluated.

Of the interventions discussed the MEND 7-13 programme is the only intervention with a published, peer-reviewed randomised controlled trial (RCT) demonstrating reductions in child obesity and improvements in health and fitness (Sacher et al., 2010). The MEND 7-13 programme has made a positive impact on childhood obesity by supporting families to achieve highly statistically significant health outcomes.

1.2.8 Conclusion

In sum, this review recognises that the evidence on interventions to treat childhood obesity through family interventions is extremely limited. The complex causal links of childhood obesity make it unlikely that a single silver-bullet intervention will be successful for all overweight and obese children. Identifying the active ingredients of childhood weight management interventions is central as many of the studies reviewed did not result in significant changes in anthropometric measurements or fitness levels at the 6 month assessment. It is

evident from this literature review that successful weight management occurred when the family and child were engaged and physical activity levels were monitored.

However, evidence is still limited with regard to associations between parental physical activity levels and their child's weight or changes in the family unit's physical activity levels during the intervention period. As a result is imperative to acquire this data from interventions in Ireland to prioritise the effective management of childhood obesity in Ireland.

1.2.9 References

- Abete, I., Astrup, A., Martínez, J. A., Thorsdottir, I., & Zulet, M. (2010). Obesity and the metabolic syndrome: role of different dietary macronutrient distribution patterns and specific nutritional components on weight loss and maintenance. *Nutrition Reviews*, *68*(4), 214-31.
- Bronfenbrenner, U. (2005). *Making human beings human: Bioecological perspectives of human development*. Thousand Oaks, CA: Sage.
- Caroli, M., & Lagravinese, D. (2002) Prevention of obesity. *Nutrition Research*. *22* (1), 221-226.
- Centers for Disease Control and Prevention. (2008). *How much physical activity do children need?* Retrieved from www.cdc.gov/physicalactivity/everyone/guidelines/children.html. (accessed on 22 May 2013).
- Daniels, S. (2006). The consequence of childhood overweight and obesity. *The Future of Children*, *6*(1), 47-64.
- Davison, K., & Birch, L. (2001). Childhood overweight: a contextual model and recommendations for future research. *Obesity Reviews*, *2*, 159-171.
- Department of Environment, Food and Rural Affairs (2013). Food Statistics Pocketbook 2013: chart data. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/243791/foodpocketbook-chartdata-19sep13.xls#chart6.2 (accessed on 22 Sept 2013).

Department of Health (2004). *Health Survey for England*. Retrieved from <http://www.ic.nhs.uk/pubs/hlthsvyeng2004upd> (accessed on 17 June 2013)

Department of Health. (2008). *Healthy Weight, Healthy Lives: Commissioning Weight Management Services for Children and Young People*. Retrieved from http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_090113 (accessed on 22 May 2013).

Department of Health. (2009). Regional Evaluation of Weight Management Programmes for Children and Families. Retrieved from www.worcester.ac.uk (accessed on 19 March 2013).

Department of Health and Children. (2008). *SLÁN 2007: Survey of Lifestyle, Attitudes and Nutrition in Ireland. Dietary Habits of the Irish Population*. Retrieved from <http://www.slan06.ie/slannutritionreportfinal.pdf> (accessed on 15 June 2013).

Department of Health and Children. (2012). Your Guide to Healthy Eating Using the Food Plate for Adults and Children over the Age of 5. Retrieved from http://www.dohc.ie/publications/pdf/YourGuide_HealthyEating_FoodPyramid.pdf (accessed on 2 August 2013).

Department of Health and Children & the Health Service Executive. (2009). The National Guideline on Physical Activity in Ireland. Retrieved from <http://www.getirelandactive.ie/content/wp-content/uploads/2011/12/Get-Ireland-Active-Guidelines-GIA.pdf> (accessed on 8 June 2013).

Department of Health and the Department for Children, Schools and Families. (2008). Healthy Weight, Healthy Lives: A Cross Government Strategy for England. Retrieved from http://webarchive.nationalarchives.gov.uk/20100407220245/http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_084024.pdf (accessed on 4 June 2013).

Durnin, J. (1992). Physical activity levels - past and present. In: *Physical Activity and Health: Symposium of the Society for the Study of Human Biology* (ed. Norden, N.G.). Cambridge: Cambridge University Press, 20-27.

Field, A. E., Laird, N., Steinberg, E., Fallon, E., Semega-Janneh, M., & Yanvovshi, J.A. (2003). Which metric of relative weight best captures body fatness in children. *Obesity Reviews*, 11, 1345-1352.

Foresight. (2007) Tackling Obesity, Future Choices, 2nd edn. Retrieved from www.bis.gov.uk/assets/bispartners/foresight/docs/obesity/17.pdf (accessed on 16 June 2013).

Fulton, J.E., Dai, S., Steffen, L. M., Grunbaum J. A., Shah, S.M., & Labarthe, D.R. (2009). Physical activity, energy intake, sedentary behavior, and adiposity in youth. *The American Journal of Preventative Medicine*, 37, S40-S49

Gallagher, A. M., Savage, J.M., Murray, L.J., Davey Smith, G., Young IS, Robson PJ., . . . Boreham, C. A. (2002). A longitudinal study through adolescence to adulthood: the Young Hearts Project, Northern Ireland. *Public Health*, 116 (6), 332-340.

Gardner, D. S. L., Hosking, J., Metcalf, B. S., Jeffery, A. N., Voss, L. D., & Wilkin, T. J. (2009). Contribution of early weight gain to childhood

overweight and metabolic health: a longitudinal study (EarlyBird 36).
Pediatrics, 123(1), 67-73

Golan, M. (2004). Parents are key players in the prevention and treatment of weight-related problems. *Nutrition Reviews*, 62, 39-50.

Golan, M., & Weizman, A. (2001). Familial Approach to the Treatment of Childhood Obesity: Conceptual Model. *Journal of Nutrition Education*, 33 (2), 102-107.

Growing up in Ireland Report. (2011). Retrieved from:

http://www.growingup.ie/fileadmin/user_upload/documents/Second_Child_Cohort_Report/Growing_Up_in_Ireland_Overweight_and_Obesity_Among_9-Year_Olds_Executive_Summary.pdf (Accessed on 5 May 2013).

Han, J. C., Lawlor, D. A., & Kimm, S. Y. S. (2010). Childhood obesity 2010: progress and challenges. *The Lancet*, 375 (9727), 1737-1748.

Hussey, J., Gormley, J. & Bell, C. (2001). Physical activity in Dublin children aged 7-9 years. *The British Journal of Sports Medicine*, 35, 268-272

Irish Universities Nutrition Alliance. (2005). *Body weight and eating habits in five -12 year old Irish children. The National Children's Food Survey*. Retrieved from www.iuna.net (accessed on 15 June 2013).

Kimm, S.Y., Glynn, N.W., Obarzanek, E., Kriska, A.M., Daniels, S.R., Barton, B.A., & Llu, K. (2005). Relation between the changes in physical activity and body-mass index during adolescence: a multicentre longitudinal study. *Lancet*, 366., 301-307

Koplan, J. P., Kraak, V. A., & Liverman, C. T. (2005). Preventing childhood obesity: Health in balance. Washington, DC: The National Academies Press.

Kumanyika, S. K., Parker, L., & Sim, L. J. (2010). *Bridging the evidence gap in obesity Prevention. A Framework to informed decision making*. Washington, DC: Institute of Medicine of the National Academies.

Lee, P. & Cunningham, K. (1990). The Irish National Nutrition Survey. Dublin: *The Irish Nutrition and Dietetic Institute*

Lobstein, T., Baur, L. & Uauy, R. (2004). Obesity in children and young people: a crisis in public health. *Obesity Reviews*, 5 (1), 4-85.

Luttikhuis, O. H., Baur, L., Jansen, H., Shrewsbury, V. A., O'Malley, C., Stolk, R. P., & Summerbell, C. D. (2009). Interventions for treating obesity in children. *Cochrane Database System Reviews*, 1.

McGovern, L., Johnson, J., Paulo, R., Hettinger, A., Singhal, V., Kamath, C., . . . Montori, V. M. (2008). Treatment of Pediatric Obesity: A Systematic Review and Meta-Analysis of Randomized Trials. *Journal of Clinical Endocrinol Metabolism*. 93 (12), 4600-4605.

Metcalf, B. S., Hosking, J., Jeffery, a N., Voss, L. D., Henley, W., & Wilkin, T. J. (2011). Fatness leads to inactivity, but inactivity does not lead to fatness: a longitudinal study in children (EarlyBird 45). *Archives of Disease in Childhood*, 96 (10), 942-7.

Munsch, S., Roth, B., Michael, T., Meyer, A. H., Biedert, E., Roth S, I., . . . Margraf, J. (2008). Randomized controlled comparison of two cognitive behavioural therapies for obese children: Mother versus mother-child cognitive behavioral therapy. *Psychotherapy and Psychosomatics*, 77 (4): 235-46.

NICE (National Institute for Health and Clinical Excellence) guidance (2006) *Obesity: The Prevention, Identification, Assessment and Management of Overweight and Obesity in Adults and Children*. NICE Clinical Guidance 43. London

Nielsen, S.J., & Popkin B.M. (2003). Patterns and trends in food portion sizes, 1977-1998. *Journal of the American Medical Association*, 289, 450-453

O'Neill, J. L., McCarthy, S. N., Burke, S. J., Hannon, E. M., Kiely, M., Flynn, M., Gibney, M. J. (2007). Prevalence of overweight and obesity in Irish school children, using four different definitions. *European Journal of Clinical Nutrition*, 61(6), 743-51.

Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., Bouchard, C., . . . King, A. C. (1995). Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of the American Medical Association*, 273, 402-407.

Proponnet, J. P. (1997) Children's views on food and nutrition: a pan-European study. In G. Smith (ed) *Children's Food Marketing and Innovation*. London: Chapman & Hall, 192-253.

Reilly, J. J., Methven, E., McDowell, Z. C., Hacking, B., Alexander, D., Stewart, L., & Kelnar, C. J. H. (2003). Health consequences of obesity. *Archives of Disease in Childhood*, 88, 748-752.

Report of the National Taskforce on Obesity: *Obesity - the policy challenges*. (2005). Retrieved from http://www.dohc.ie/publications/report_taskforce_on_obesity.html (accessed on 16 June 2013).

- Rosenkranz, R. R. & Dzewaltowski, D. A. (2008). Model of the home food environment pertaining to childhood obesity. *Nutrition Reviews*, 66 (3), 123-140.
- Sacher, P., Kolotourou¹, M., Chadwick, P., Cole, T., Lawson, M. S., Lucas, A., & Singhal, A. (2010). Randomized Controlled Trial of the MEND Program: A Family-based Community Intervention for Childhood Obesity. *Obesity*, 18 (1), S62-S68.
- Sacks, G., Swinburn, B., & Lawrence, M. (2008). A systematic policy approach to changing the food system and physical activity environments to prevent obesity. *Australia and New Zealand Health Policy*, 5(13).
- Sato, A., Jelalian, E., Hart, C., Lloyd-Richardson, E., Mehlenbeck, R., Neill, M. & Wing, R. (2011) Associations between parent behavior and adolescent weight control. *Journal of Pediatric Psychology*, 36, 451-460.
- Scottish Intercollegiate Guidelines Network. (2010) *Report No. 115: Management of Obesity: A National Clinical Guideline*. Retrieved from: <http://www.sign.ac.uk> (accessed on 1 June 2013).
- Share, M., & Strain, M. (2008). Making schools and young people responsible: a critical analysis of Ireland's obesity strategy. *Health & Social Care in the Community*, 16(3), 234-243.
- Singh, A.S., Mulder, C., Twisk, J.W., van Mechelen, W., & Chinapaw, M.J. (2008). Tracking of childhood overweight into adulthood: a systematic review of the literature. *Obesity Reviews*, 9, 474-488.

Strauss, R. S., Rodzilsky, D., Burack, G. & Colin, M. (2001). Psychosocial Correlates of Physical Activity in Healthy Children. *Archives of Pediatric and Adolescent Medicine*, 155, 897-902.

Swinburn, B. A., Sacks, G., & Ravussin, E. (2009). Increased energy intake alone virtually explains all the increase in body weight in the United States from the 1970's to the 2000's. *European Journal of Obesity*, 2(2), 1-256.

Swinburn, B. A., Sacks, G., Hall, K. D., McPherson, K., Finegood, D. T., Moodie, M. L., & Gortmaker, S. L. (2011). The global obesity pandemic: shaped by global drivers and local environments. *The Lancet*, 378, 804-814.

The National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development.(2008).Retrieved from http://www.nichd.nih.gov/news/releases/pages/july152008_physical_activity.aspx (accessed on 4 May 2013).

Troiano, R. P., Briefel, R. R., Carroll, M. D., & Bialostosky, K. (2000). Energy and fat intakes of children and adolescents in the United States: data from the National Health and Nutrition Examination Surveys. *American Journal of Clinical Nutrition*, 72(5) 343S-1353S.

Troiano, R.P., Berrigan, D., Dodd, K. W., Masse, L. C., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine and Science in Sports Exercise*, 40, 181-188.

Twiddy, M., Wilson, I., Bryant, M., & Rudolf, M. (2012). Lessons learned from a family-focused weight management intervention for obese and overweight children. *Public Health Nutrition*, 15(7), 1310-1317.

Ventura, A. K., & Birch, L. L. (2008). Does parenting affect children ' s eating and weight status? *International Journal of Behavioral Nutrition and Physical Activity*, 12, 2-3.

World Health Organisation. (2013). Obesity and Overweight Factsheet 2013.

Retrieved from

<http://www.who.int/mediacentre/factsheets/fs311/en/index.html>

(Accessed on 15 June 2013).

Zeller, M., Daniels, S. (2004). The obesity epidemic: Family matters. *The Journal of Pediatrics*, 145(1), 3-4.

PAPER 2
RESEARCH PAPER



Department of Clinical Sciences and Nutrition

M.Sc in Weight Management

Project Title:

A questionnaire survey to determine the effectiveness of the “Making
a Difference” weight management programme on the lifestyle
choices of the whole family unit

Assessment Number: 1125372

Research Paper Word Count: 4,221

Key words: *childhood obesity, physical activity, parental influence*

Journal Selection

Journal Choice: *Journal of Physical Activity and Health*

The Journal of Physical Activity and Health publishes original research and review papers examining the relationship between physical activity and health. The journal focuses on research in fields of chronic disease (weight control) in which physical activity may play a role in the treatment. My research identified and discussed the positive association of the parents and the family physical activity levels with a change in their child's BMI. As a result I feel this journal is an appropriate selection. My research paper also meets the submission guidelines as outlined below;

- All sections are double-spaced
- Page numbers appear in bottom right corner
- Abstract is formatted and contains fewer than 200 words
- Page count maximum of 5,000 words, including everything *except* title and abstract pages
- Fewer than 10 tables/figures

2.1 Research Article Abstract

Background: The number of children overweight in Ireland is increasing by 10,000 annually (National Taskforce on Obesity, 2005). While childhood obesity interventions continue to be commissioned by a variety of organisations, the majority of evidence on the effectiveness of childhood obesity management programmes is derived sources outside of Ireland. The limited published literature on the treatment of childhood obesity through family interventions in Ireland endorses an important knowledge gap. Subsequently, this reinforces the importance of acquiring data from Irish family interventions.

Objective: This research aims to investigate the association between participating in the "Making A Difference" weight management programme and making positive lifestyle choices for the whole family unit.

Method: To address the prevalence of childhood obesity at a local level the Border Counties Childhood Network (BCCN) successfully tendered to deliver the Up4It! Programme. This research analysed the "Making A Difference" component of the Up4It! Programme. The overall goal of the intervention was to maintain or decrease the participant's Body Mass Index (BMI). To achieve this, reducing energy intake and increasing energy output were defined. The programmes were delivered in four areas within counties Cavan and Monaghan. Parents were asked to attend 12 weekly group sessions with other children and families. To be eligible for the programme children must be aged 8 - 11 years, BMI > 91st percentile; must be an at risk group (family history, inactive, at risk of

developing co-morbidity), medically fit and the family must be at contemplative stage of behavioural change.

Results:

The results found a significant ($p < .01$) change in the child's BMI at post intervention analyses ($t = 2.88$ $df = 29$ $p < .007$). A significant ($p < .005$) change in the child's BMI z-scores was also observed between pre and post intervention ($t = 3.029$ $df = 29$ $p < .005$). The parents pre assessment physical activity levels was found to interact with a change in their child's BMI ($f = 4.858$ $df = 2$ $p > .05$). A positive association was also identified between the family unit's pre assessment physical activity levels and a change in their child's BMI post intervention.

Conclusion:

Overall this study will add to the limited evidence base for childhood obesity management interventions in Ireland. These results compare favourably with similar interventions in the U.K. and has demonstrated the potential of the "Making a Difference" programme to increased physical activity levels and decrease mean BMI in children. In addition, parental physical activity levels pre intervention has been identified as an active ingredient in childhood weight management intervention, in this study.

2.2 Research Article

2.2.1 Introduction

Historically, a heavy child meant a healthy child, and the concept “bigger is better” was widely accepted. Today, regardless of public health warnings this perception might not have changed for some, as there is evidence that childhood obesity has reached epidemic proportions worldwide (Lobstein, Baur & Uauy, 2004). Recent statistics from the World Health Organization (WHO) have reported that the worldwide prevalence of childhood obesity has increased from 4.2% in 1990 to 6.7% in 2010. This trend is expected to reach 9.1% or 60 million, in 2020 (Han, Lawlor & Kimm, 2010; Onis, Blo, & Orghi, 2010). The International Obesity Task Force’s review of obesity in children and young people has estimated that at least 155 million school age children worldwide are overweight or obese, representing one in ten of all children (Lobstein, Baur & Uauy, 2004).

In Ireland, the National Taskforce on Obesity (2005) suggests that the number of overweight children has trebled over the last decade with the number increasing by 10,000 annually. The most recent Irish results come from the WHO European Childhood Obesity Surveillance Initiative (2011) cited by Department of Health and Children (2011) found that of 13% of 7 year old boys were overweight with a further 5% obese while 19% of girls were overweight with a further 7% obese. In summary almost one-quarter of 7 year old Irish children are either overweight or obese. Conversely, Han et al. (2010) suggests that prevalence of childhood obesity might be abating in some developing

countries due to the response of intervention programmes put in place over the past number of years to tackle childhood obesity. The statistics outlined suggest this is not yet the case in Ireland. Consequently, there is an urgent need to prioritise the effective management of childhood obesity in Ireland.

The global concern over the rising prevalence of overweight and obesity has been the focus of extensive research and debate over the past three decades. However, the complex causal links of childhood obesity make it unlikely that a single silver-bullet intervention will be successful for all overweight and obese children. The importance of a combined dietary, physical activity and behavioural component has been highlighted by several studies (Luttikhuis et al, 2009; NICE, 2006). Identifying the active ingredients of childhood weight management interventions is central to assist children moving from obese to normal weight over time.

Although the ideal weight management intervention has not been identified yet, key principles are acknowledged. A family-centred approach combining lifestyle and behavioural techniques to improve dietary intake, increase physical activity, reduce physical inactivity and improve the familial health outcomes. It is evident from a number of studies that successful weight management occurs when the family and child were engaged (Golan & Weizman, 2001; Luttikhuis et al. 2009; Rosenkranz & Dzewaltowski, 2008). The current challenge is to develop an effective intervention that takes into account differences in age, environment and culture across the whole family unit (Berry et al., 2004). For this reason it is essential to develop, explore, assess and disseminate practical interventions

that are effective. The majority of the evidence is derived from UK-based research, which limits generalisability to Ireland given health care system differences. These differences reinforce the importance of acquiring data from interventions in Ireland. The aim of this research is to identify if positive parental influence occurred as a result of the programme which has led to a healthier lifestyle for the whole family unit.

2.2.2 Method

The “Making a Difference” Weight Management Programme was designed to address the prevalence of childhood obesity at a local level. The Border Counties Childhood Network (BCCN) successfully tendered to deliver the Up4It! programme. Following the successful tender a Project Board was established, comprising representatives of a number of bodies from both the voluntary and statutory sector. This project was made possible with funding secured from the European Union’s INTERREG IVA programme by Co-operation and Working Together (CAWT), the cross border health services partnership. The CAWT Obesity project (Up4It!) is part of CAWT’s ‘Putting Patients, Clients and Families First’ EU funded initiative. In partnership with the BCCN a number of other statutory and voluntary bodies collaborated in the development of ‘Up4It! Cavan/Monaghan Families Getting Healthy Together’ which include Health Service Executive (HSE) Dublin North East, Cavan and Monaghan County Childcare Committees (CCC), Cavan RAPID, Enable Ireland, Monaghan Education Centrem Monaghan and Cavan Sports Partnerships, Breffni Integrated and Monaghan Integrated Development. The project was developed

by health professionals with expertise in nutrition/dietetics, physical activity, and psychology.

This retrospective report focuses on the “Making a Difference” weight management programme which targeted parents with overweight children (Body Mass Index >91st centile) aged 8-11years . The aim of the programme was to support families in making healthier lifestyle choices to avoid/reduce the incidence of long term chronic diseases i.e. obesity, diabetes and heart disease in the children’s future. The overall goal of the intervention was to maintain or decrease the child’s Body Mass Index (BMI). To achieve this, reducing energy intake and increasing energy output were defined. The programmes were delivered in four areas within counties Cavan and Monaghan. Parents were asked to attend 12 weekly group sessions with other children and families. These sessions were a mixture of fun activities based on healthy eating, cooking, confidence building, play and active games with motivational incentives for participating families.

To be eligible for the programme children must have be aged 8 - 11 years, BMI > 91st percentile; must be an at risk group (family history, inactive, at risk of developing co-morbidity), medically fit , the family must be at contemplative stage of behavioural change and at least one parent must attend the programme with their child.

The programme was based on a balanced healthy diet, using appropriate guidance from the HSE food pyramid. The physical activity component delivered

was varied and focused on developing activity skills to achieve the recommended level of activity (60 minutes of moderate physical activity per day for children, and at least 30 minutes per day, five times a week for adults).

2.2.3 Hypotheses

The general study hypothesis is as follows;

There is a significant relationship between participating in the "making a difference" weight management programme and positive lifestyle choices for the whole family unit.

Null hypothesis: There is no significant relationship between participating in the "making a difference" weight management programme and positive lifestyle choices of the whole family unit.

This is addressed by the following series of sub hypotheses;

Null hypothesis 1: There will be an increase in the child's BMI post intervention.

Alternative hypothesis 1: There will be a decrease or no change in the child's BMI post intervention.

Null hypothesis 2: There is no association between the parents physical activity levels pre and post intervention, in the target population.

Alternative hypothesis 2: There is an association between the parents activity pre and post intervention, in the target population.

Null hypothesis 3: There is no association between the family unit physical activity levels pre and post intervention, in the target population.

Alternative hypothesis 3: There is an association between the family unit physical activity levels pre and post intervention, in the target population.

Null hypothesis 4: There is no interaction between the parent's physical activity and their child's BMI pre and post intervention, in the target population.

Alternative hypothesis 4: There is an interaction between the parent's physical activity and their child's BMI pre and post intervention, in the target population.

2.2.4 Questionnaire Design and Distribution

The study design chosen is quantitative analysis. Questionnaires were the chosen tool for ease of data analysis. The main criteria used for the selection was the validity and reliability properties, while allowing for the quick collection of data from a large group size. The questionnaires were administered at each of the 4 pilot sites at week 1 (pre) and at week 12 (post) of the intervention. A questionnaire was developed for completion by the parents and included dietary, physical activity and self-esteem related questions (Appendix A). This study is only concerned with the results from dietary and physical activity questions. Dietary intake was assessed via dietary recall. IPAQ questions were

used to analyse physical activity data. The IPAQ questions are structured to provide scores on walking, moderate-intensity and vigorous-intensity activity. The questionnaire responses were re-coded into three categorical scores; “low”, “moderate” and “high” as defined by the IPAQ working group (IPAQ, 2005). The use of the IPAQ questions will enhance the comparability between this evaluation and any follow up evaluations. The validity and reliability of the IPAQ has been assessed by several investigators in different populations and settings (Hagströmer, Ainsworth, Oja & Sjöström, 2010; Van der Ploeg et al., 2010). The IPAQ questions and dietary intake questionnaires were completed by all parents pre and post the intervention.

Cardio-respiratory fitness levels were measured using the 20m Multistage Endurance Shuttle-Run Test. This test has been shown to be a reliable and valid method of estimating peak oxygen consumption ($\dot{V}O_{2\max}$). It required the children to run between two lines 20m apart in time to recorded beeps. The speed of the beeps increased after every minute or level.

2.2.5 Demographics and anthropometrics

Age, sex, weight and height measures were routinely collected at each pilot site and recorded. The children were weighed using a Seca scales (Seca GmbH & Co. KG., Hamburg, Germany) accurate to 0.23 kg and height was measured using a stadiometer by the programme coordinator.

The agreed sample size was 14 families per site; deemed manageable by the steering group. To ensure 14 families completed the programme, a 50% dropout rate was applied. As a result over 25 families were initially taken into each programme site. However, collection of data was not complete for all families who participated in the programme. Consequently this research will analyse the data for the 30 children and their parents who completed the programme and for whom full data is available.

The age range was refined following consultation at a multi-stakeholder obesity planning workshop with a recommendation to narrow the provision of the programme from the 5-11 years to 8-11 years due to the wide diversity in children's capabilities at the initial age range.

Ethical approval for this study was obtained by the University of Chester's Faculty of Applied and Health Sciences Research Ethics Committee (Appendix B).

2.2.6 Statistical Analysis

The results are presented using descriptive statistics, including mean and standard deviations, which were calculated for all key variables. Comparisons of the continuous variables for pre and post intervention were made using paired t - tests. Cross tabulation was used to identify the relationship between the variables. The McNemar test used the results of the cross tabulations to test if there has been a change for two related categorical variables. Chi- Square

tests were used to analyse whether or not the two variables are independent, for example, to compare parent physical activity levels pre and post intervention. A mixed ANOVA was conducted to compare independent groups design with repeated measures (pre and post intervention). An interaction plot is used to show these differences. All statistical analyses were made using the Statistical Package for Social Sciences (SPSS) for Windows (Version 20) with the raw data presented in Appendix C. The statistical ratios t and F were used to test the null hypotheses. The statistical significance was set at $p \leq 0.05$

BMI is the most frequently used measure for obesity prevalence. However, to account for the child's age and gender, BMI standard deviations (SD) were also used. BMI thresholds are defined in terms of a specific z -score or SD score which indicates how many units a child's BMI is above or below the average BMI value for their age group and sex. A z -score of 1.5 indicates that child is 1.5 SDs above the average value and a z -score of -1.5 indicates a child is 1.5 SDs below the average value (Dinsdale, Ridler & Ells ,2011).

2.2.7 Results

Results of this study analysed pre-assessment (week1) and post-assessment (week 12) data only. The results demonstrate positive and significant improvements in physical outcomes (anthropometry, cardiovascular fitness and physical activity habits) as well as improvements in nutritional scores.

Complete data on weight, height and age were available on 20 girls and 10 boys. The children's anthropometric pre and post intervention data are outlined in Table 1. Physical activity levels, height, BMI and BMI z-scores were all found to be significantly different ($p \leq .05$) at post assessment when compared to pre assessment measurements. No differences between participants were recorded for the other body measurements ($p > 0.05$).

Table 1 Children's anthropometric measurements pre and post intervention.

Paired Samples Test									
	Paired Differences					t	Df	Sig. (2-tailed)	
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
				Lower	Upper				
Pair 1	Height(cm) - Height(cm)	-3.8767	1.1605	.2119	-4.3100	-3.4433	-18.297	29	.000
Pair 2	Weight(kg) - Weight(kg)	-1.1366	3.05935	.55856	-2.27905	.00571	-2.035	29	.051
Pair 3	W.Circum(cm) - WaistPost(cm)	.0867	4.3794	.7996	-1.5486	1.7220	.108	29	.914
Pair 4	BMI zscore Pre - BMI zscore Post	.12067	.21820	.03984	.03919	.20215	3.029	29	.005
Pair 5	PAT - PATPost	-1.0345	.7518	.1396	-1.3205	-.7485	-7.410	28	.000
Pair 6	BMI Pre (kg m ⁻²) - BMIPost	.7300	1.3882	.2534	.2117	1.2483	2.880	29	.007

The significant change in child BMI ($t=2.88$ $df=29$ $p=.007$) indicates a strong change in BMI after the intervention. It must be noted that the low mean BMI value of 24.14(kg m⁻²) at the pre intervention assessment is due to the inclusion

of siblings on the intervention. The BMI range pre and post intervention is 20-32.5 (kg m⁻²).

The visual representation of the six variables reported in the paired t-test is illustrated in figure 1. The whiskers on each bar represent CI 95% of difference. Where the whiskers cross the zero line illustrates the difference was not significant as validated by the paired *t*-tests. This highlights the average BMI decrease, in the population, of 95% CI of difference (.2117, 1.248). Therefore if the intervention is rolled out on a national level there is a 95% confidence that the change in the participants would be between .212 and 1.248 units of BMI.

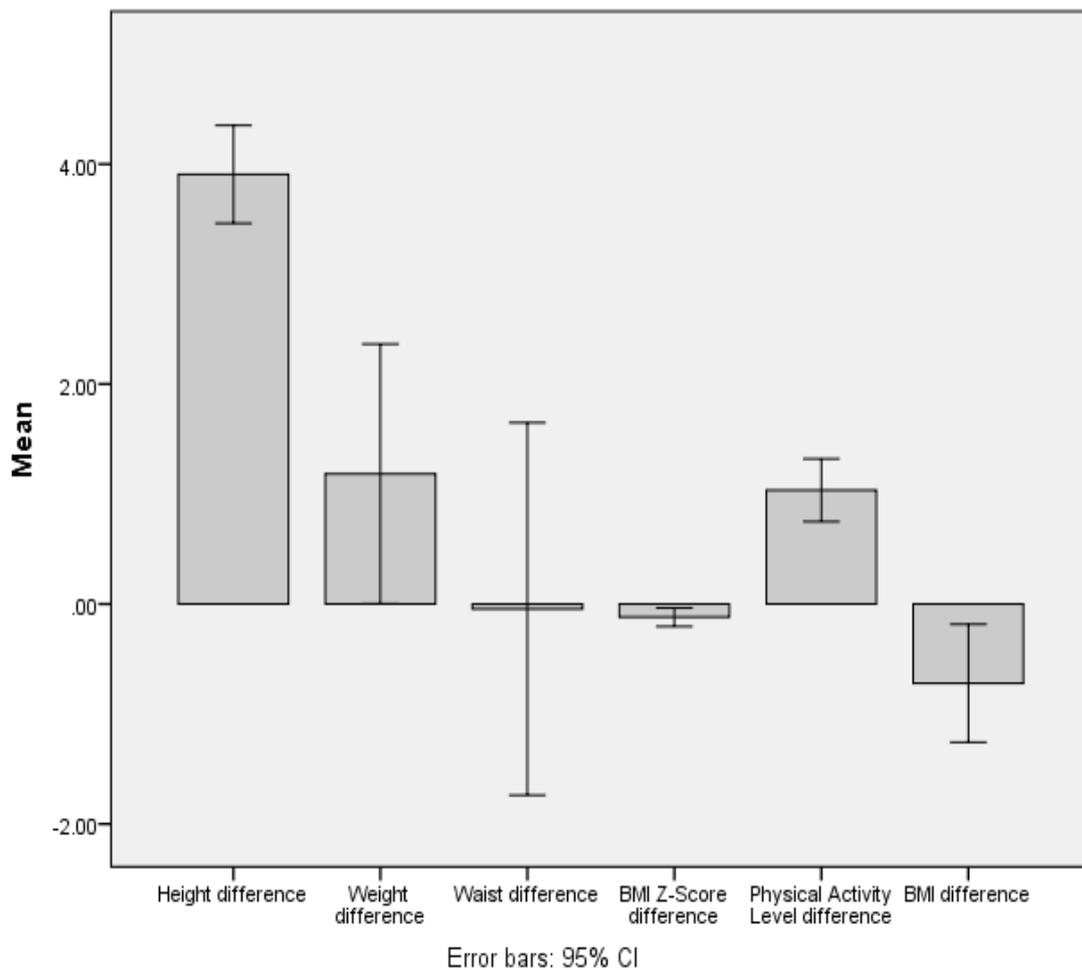


Figure 1 95% CI of difference for the six reported variables

A significant change in the child's BMI z-scores was also observed between pre and post intervention ($t=3.029$ $df=29$ $p<.005$). The programme yielded a mean BMI z-score reduction of 0.1207. It was identified that the BMI z-score has a much smaller range than the other variables with a pre range of 1.63-1.95 and post range 1.49-1.86.

Regarding the difference in results between the four sites, it was found that Bailborough had no change on average, with Castleblaney yielding the largest change in children's BMI.

Dietary markers showed an improvement in the quality of parent and children diets, with the number of portions of fruit and vegetables consumed increasing for both. At pre intervention 26.7 % of adults and 20% of children consumed 5+ portions of fruit and vegetables per day. This increased to 43.3% and 46.7% respectively at the end of the intervention.

Regarding parents physical activity levels pre and post intervention, no significant association ($\chi^2=6.245$ $df=4$ $p>.05$) was identified, in the target population. As a result the null hypothesis is supported. However, on further data analysis it identified that the parents pre assessment physical activity levels does interact with a change in their child's BMI ($f=4.858$ $df=22$ $p=.018$)(Table 2).

Table 2 Child’s BMI Change and Parents Pre and Post Activity

Mixed ANOVA table – Child’s BMI Change and Parents Pre and Post Activity

Effect	Value	F	Hypothesis df	Error df	Sig.
BMI* ParentPAPre	.306	4.858 ^b	2.000	22.000	.018
Child BMI * ParentPAPre * ParentPAPost	.198	1.813 ^b	3.000	22.000	.174
Child BMI* ParentPAPost	.195	5.327 ^b	1.000	22.000	.031
Child BMI* ParentPAPre	.067	.794 ^b	2.000	22.000	.464

a. Design: Intercept + ParentPAPre + ParentPAPost + ParentPAPre * ParentPAPost

Within Subjects Design: Child BMI

b. Exact statistic

The interaction between child’s BMI and their parents physical activity levels post intervention; the child’s BMI and their parents physical activity levels pre intervention and parents physical activity level post intervention were both found to have no significant interactions (all $p > .05$). Figure 2 illustrates the greatest impact on the child’s BMI were children’s parents whom physical activity levels measured low at pre-intervention.

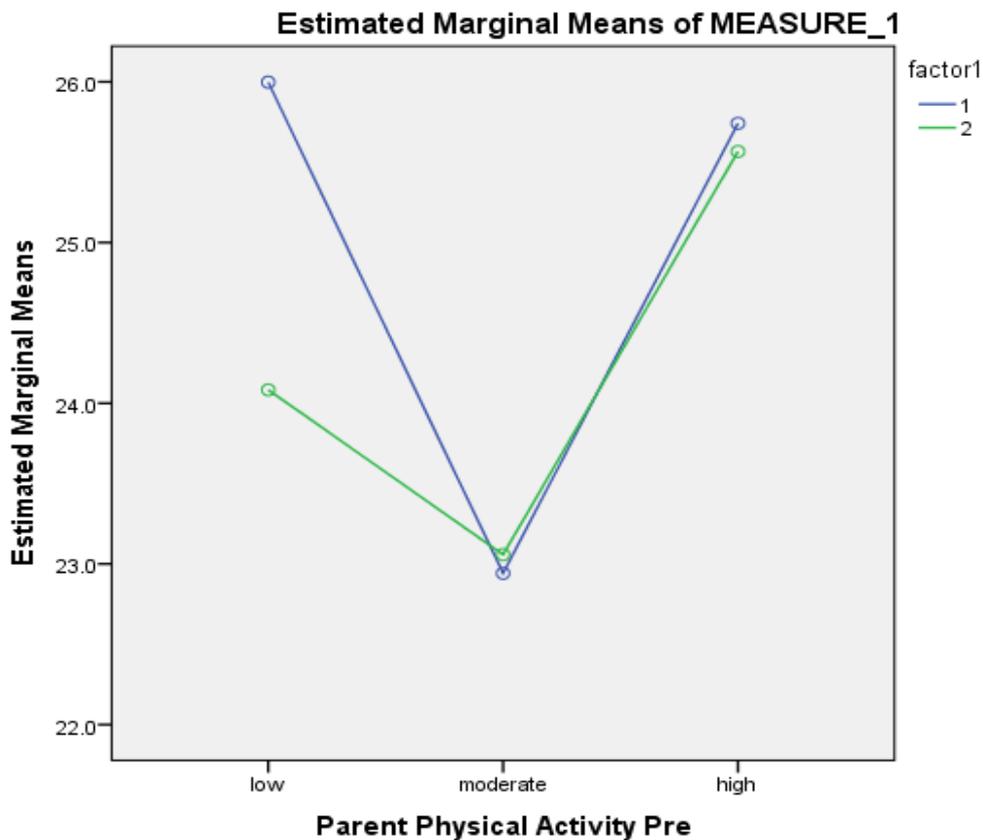


Figure 2 Association between parent’s pre assessment physical activity levels and their child’s BMI pre and post intervention

Similar outcomes were identified in the family’s physical activity levels. Although the results found were not significant they did identify that families who had the lowest physical activity level at the pre intervention assessment resulted in the biggest change on their child’s BMI post intervention. The results also highlighted that at the post intervention assessment no family was participating in physical activity every day.

Positive changes were observed in parents total physical activity levels, moderate total physical activity levels and vigorous physical activity levels pre

and post intervention, as outlined in Table 3. Only vigorous physical activity was found to be significant ($t=-2.506$ $df=29$ $p=.018$).

Table 3 Parent's moderate, vigorous and total physical activity levels pre and post intervention

Paired Samples Test								
	Paired Differences					t	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Total Physical Activity Pre - Total Physical Activity Post	-59.90	540.077	98.604	-261.568	141.768	-.607	29	.548
Pair 2 Vigorous Post- Vigorous Pre	-64.50	140.996	25.742	-117.149	-11.851	-2.506	29	.018
Pair 3 Moderate Pre - Moderate Post	-35.33	259.638	47.403	-132.284	61.617	-.745	29	.462
Pair 4 Walking Pre - Walking Post	42.50	369.043	67.378	-95.303	180.303	.631	29	.533

Crosstabulation was used to identify if there is a change in the the number of parents meeting the National recommendation of 30mins of physical activity five days per week. The results found 50% of parents who were below the recommendation pre intevention are meeting the requirements post intervention. However 25% of parents who were meeting the recommendations pre intevention were found to be below the requirements post intervention. In total, 63% of the parents were meeting the physical activity recommnedations post interevention.

2.2.8 Discussion

This aim of this study was to evaluate the the relationship between participating in the "Making A Difference" weight management programme and making positive lifestyle choices of the whole family. Findings identify a positive associations between participating in the programme and positive lifestyle choices. This programme showed consistency with previous research on childhood obesity interventions in the U.K. and supports a family based model of intervention that produced positive effects regarding weight in overweight children.

A reduction of 0.12 in BMI *z*-score demonstrates the effectiveness of the intervention. This determines that at post intervention the mean BMI *z*-score is still 1.7 SDs above the average value for their age and sex. However, this reduction in BMI *z*-score compares favourably with previous studies; Luttikhuis et al. (2009) who found the average reduction of BMI *z*-scores to be 0.06 for childhood obesity interventions. A randomised controlled trial of the MEND 7-13 programme found a reduction in BMI *z*-score (-0.24 ; $P < 0.0001$) at 6 months (Sacher et al., 2010). The "Making a Difference" programme results are for 3 months, it would be expected that if the programme continued that the participants would yield similar results to the MEND 7-13 programme at 6 months. The significance of this change is highlighted by Reinehr and Andler (2004) who suggest that a decrease in BMI *z*-score of 0.5 over 1 year may improve cardiovascular and metabolic risk factors in overweight children.

The statistically significant improvements identified in the children's physical activity levels ($p < .000$) are concurrent with the significant increase in children's cardiovascular fitness observed in the 'MEND' 7-13 intervention ($p < 0.001$) and the significant decreased the children's mean heart rate stated by the 'WATCH IT!' intervention ($p < 0.001$). This highlights the importance of physical activity in the effectiveness of weight management as all three programmes also produced significant reductions in the children's BMI standard deviation (SD) scores (all $p < .05$).

The main result of the present analysis is that parent's physical activity levels pre intervention positively interacts with a change in their child's BMI. Consistent with the Golan and Weizman (2001) social ecological theory and the results from Sato et al. (2011) this study affirms that the parent is the most influential environmental variable regarding a child's weight. Similar outcomes for children were observed in a 4-year longitudinal study Fulton, Dai, Steffen, Grunbaum and Labarthe (2009) and found that children's moderate-to-vigorous physical activity at baseline was inversely related to changes in BMI. Consequently, this study's results substantiate that promoting parental lifestyle changes may be a key factor in determining the child's own treatment outcome.

The positive association identified between the family units pre assessment physical activity levels and their child's BMI, in the target population, also confirms that parents play a key role in the development of a child's lifestyle behaviours. These results are in agreement with current recommendations that the relationship between the child's characteristics and childhood obesity is

likely to be moderated by their parent's behaviours (Zeller & Daniels, 2004). Therefore parents require appropriate advice and support to make the necessary lifestyle changes for their family.

These results confirm that physical activity is an important factor in addressing obesity as energy expenditure is potentially modifiable (Metcalf, Hosking, Jeffery, Voss, Henley & Wilkin, 2011). This is further verified in this study as 50 % of parents who were below the the National Guidelines for Physical Activity in Ireland (2009) for adults pre intervention are meeting the requirements post intervention. The guidelines state that adults should participate in at least 30 minutes of moderate intensity physical activity five days per week.

In relation to children, the National Guidelines for Physical Activity in Ireland (2009) state that all children aged 2-18 years should be active, at a moderate to vigorous level, for at least 60 minutes every day. Unfortunately this level of information was not collected during this study. In an attempt to fill the existing knowledge gaps, future data collection needs to include the children's physical activity levels and their parents anthropometric measures which were not collected during the "Making a Difference" programme.

Further comprehensive programme research is also required. Supplementary analysis of the "Making a Difference" follow-up data collected at three, six and 12 months will give a good indication of whether the lifestyle changes promoted by the programme have been adopted by the families and whether they have led improved changes to cardiovascular and metabolic risk factors.

Addressing lifestyle change at the family level is important given the clustering of overweight in families and shared environmental factors. Although there is a general consensus that dietary intake and physical activity has an important role in the development of childhood obesity, there are differences in data collection and recording across similar interventions reviewed in the U.K. This limits result comparisons and consequently it is possible to only yield weak inferences and is particularly true for the energy expenditure data. Objective measures of energy expenditure, for example, accelerometer or doubly labelled water would be a more accurate method to use and less subject to reporting bias when compared with questionnaires which are based on participant recall (Slootmaker, Schuit, Chinapaw, Seidell & van Mechelen, 2009).

This intervention meets International recommendations that the core elements of any initiative to address childhood obesity should involve the whole family while also including nutrition education, promotion of physical activity and behaviour modification (Luttikhuis et al, 2009 & NICE, 2006). However, further research needs to be undertaken to explore the psychological processes affected by this intervention and which measurements predicts the most beneficial effects on children's BMI.

Due to the short timeframe of the programme, it did not result in children who were overweight moving to normal weight. This research did however, identify that parents physical activity levels pre intervention is a key component to improved health outcomes in their children. With regards to the future roll out of

the “Making a Difference” community based family intervention the following changes could be made to yield more significant findings;

- Target families with parents at the contemplative stage of change who have who have low physical activity levels.
- Collect parent’s anthropometric measurements pre and post intervention
- Collect children’s physical activity levels using an accelerometer.

2.2.9 Conclusion

This evidence-based programme had a positive impact on childhood obesity by supporting families to achieve significant health outcomes. The “Making a Difference” programme has demonstrated, in this study, its potential to increase physical activity levels and decrease children’s BMI. These results confirm the hypothesis that there is a significant relationship between participating in the "making a difference" weight management programme and positive lifestyle choices for the whole family unit. Greatest weight loss in children was observed in those whose parent physical activity levels at pre intervention assessment were low.

This study confirms the importance of physical activity, which is half of the energy balance equation and the volitional component of energy expenditure, has on the effectiveness of weight management interventions. Further work should focus on a detailed statistical analysis of families with low physical activity levels pre intervention.

Overall this research will add to the limited evidence base for childhood obesity weight management interventions in Ireland. The results offer a perspective on what sections of the “Making a Difference” programme has led to positive outcomes and under what circumstance. This will allow BCCN to make changes to the programme to the improve success rate and therefore use resources more effectively.

2.2.10 References

- Berry, A., Sheehan, R., Heschel, R., Knafelz, K., Melkus, G., & Grey, M. (2004). Family-based interventions for childhood obesity: A review. *Journal of Family Nursing, 10*(4), 429-449.
- Dinsdale, H., Ridler, C., & Eells, L. (2011). A simple guide to classifying body mass index in children. *Oxford*: National Obesity Observatory.
- Department of Health and Children & the Health Service Executive. (2009). The National Guideline on Physical Activity in Ireland. Retrieved from <http://www.getirelandactive.ie/content/wp-content/uploads/2011/12/Get-Ireland-Active-Guidelines-GIA.pdf> (accessed on 8 June 2013).
- Department of Health and Children. (2011). Retrieved from <http://www.dohc.ie/press/speeches/2011/20110616.html> (accessed on 15 April 2013).
- Fulton, J.E., Dai, S., Steffen, L. M., Grunbaum J. A., Shah, S.M., & Labarthe, D.R. (2009). Physical activity, energy intake, sedentary behavior, and adiposity in youth. *The American Journal of Preventative Medicine, 37*, S40-S49
- Golan, M., & Weizman, A. (2001). Familial Approach to the Treatment of Childhood Obesity: Conceptual Model. *Journal of Nutrition Education, 33* (2), 102-107.
- Hagströmer, M., Ainsworth, B.E., Oja, P., & Sjöstrom, M. (2010). Comparison of a subjective and an objective measure of physical activity in a population sample. *Journal of Physical Activity & Health, 7*, 541-550.

Han, J. C., Lawlor, D. A., & Kimm, S. Y. S. (2010). Childhood obesity 2010: progress and challenges. *The Lancet*, 375 (9727), 1737-1748.

International Physical Activity Questionnaire. (2005). Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ) - Short and long forms. Available at <http://www.ipaq.ki.se/scoring.pdf> (Accessed on 2 August 2013).

Lobstein, T., Baur, L. and Uaur, R. (2004). Obesity in children and young people: a crisis in public health. *Obesity Reviews*, 5 (1), 4-85.

Luttikhuis, O. H., Baur, L., Jansen, H., Shrewsbury, V. A., O'Malley, C., Stolk, R. P., & Summerbell, C. D. (2009). Interventions for treating obesity in children. *Cochrane Database System Reviews*, 1.

Metcalf, B. S., Hosking, J., Jeffery, a N., Voss, L. D., Henley, W., & Wilkin, T. J. (2011). Fatness leads to inactivity, but inactivity does not lead to fatness: a longitudinal study in children (EarlyBird 45). *Archives of disease in childhood*, 96 (10), 942-7.

NICE (National Institute for Health and Clinical Excellence) guidance (2006) *Obesity: The Prevention, Identification, Assessment and Management of Overweight and Obesity in Adults and Children*. NICE Clinical Guidance 43. NICE: London

Reinehr, T. & Andler, W. (2004). Changes in the atherogenic risk factor profile according to degree of weight loss. *Archives of Disease in Childhood*, 89(5), 419-422.

Report of the National Taskforce on Obesity: *Obesity - the policy challenges*. (2005). Retrieved from

http://www.dohc.ie/publications/report_taskforce_on_obesity.htm

(accessed on 16 June 2013).

Rosenkranz, R. R. & Dzewaltowski, D. A. (2008). Model of the home food environment pertaining to childhood obesity. *Nutrition Reviews*, 66(3), 123-140.

Sacher, P., Kolotourou¹, M., Chadwick, P., Cole, T., Lawson, M. S., Lucas, A., & Singhal, A. (2010). Randomized Controlled Trial of the MEND Program: A Family-based Community Intervention for Childhood Obesity. *Obesity*, 18(1), S62-S68.

Sato, A., Jelalian, E., Hart, C., Lloyd-Richardson, E., Mehlenbeck, R., Neill, M. & Wing, R. (2011) Associations between parent behavior and adolescent weight control. *Journal of Pediatric Psychology*, 36, 451-460.

Slootmaker, S. M., Schuit, A. J., Chinapaw, M. J., Seidell, J.C., & van Mechelen, W. (2009). Disagreement in physical activity assessed by accelerometer and self-report in subgroups of age, gender, education and weight status. *International Journal of Behavioral Nutrition Physical Activity*, 6, 17.

Van der Ploeg, H.P., Tudor-Locke, C., Marshall, A.L., Craig, C., Hagströmer, M., Sjöström, M., & Bauman, A. (2010). Reliability and validity of the international physical activity questionnaire for assessing walking. *Research Quarterly in Exercise & Sports*, 81, 97-10.

Zeller, M., Daniels, S. (2004). The obesity epidemic: Family matters. *The Journal of Pediatrics*, 145(1), 3-4.

APPENDICES

Appendix A Questionnaire Completed by the Parent

Appendix B Ethical Approval Letter



University of
Chester

*Faculty of Applied Sciences
Research Ethics Committee*

frec@chester.ac.uk

30th July 2013

Dear Aine,

Study title: A questionnaire survey to determine the effectiveness of the “Making a Difference” weight management programme on the lifestyle choices of the whole family unit.
FREC reference: 834/13/AC/CSN
Version number: 1

Thank you for sending your application to the Faculty of Applied Sciences Research Ethics Committee for review.

I am pleased to confirm ethical approval for the above research, provided that you comply with the conditions set out in the attached document, and adhere to the processes described in your application form and supporting documentation.

However, the Committee would like to request the following amendments:-

- All references should be cited.
- Correct typographical errors in the text.

Please forward a copy of the amended documentation to frec@chester.ac.uk

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
Application Form	1	July 2013
Appendix 1 – List of References	1	July 2013
Appendix 2 – C.V. for Lead Researcher	1	July 2013
Appendix 3 – Written Permission, Border Counties Childhood Network	1	July 2013
Appendix 4 – Family Lifestyle Questionnaire	1	July 2013
Appendix 5 – Guidelines for Data Processing and Analysis of IPAQ short questionnaire	1	July 2013
Appendix 6 – Up4it Programme outline	1	July 2013

With the Committee's best wishes for the success of this project.

Yours sincerely,

Dr. Stephen Fallows
Chair, Faculty Research Ethics Committee

Enclosures: Standard conditions of approval.

Cc. Supervisor/FREC Representative