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**EXERCISE AS A PSYCHOLOGICAL THERAPY
IN OBESE ADOLESCENTS**

Robert James Copeland

**A thesis submitted in partial fulfilment of the requirements of
Sheffield Hallam University
for the degree of Doctor of Philosophy**

January 2007



ABSTRACT

Childhood obesity has reached epidemic proportions globally (Wang & Lobstein, 2006). Obesity has been linked with psychopathology in adolescents seeking treatment (Zametkin, Zoon, Klein & Munson, 2004). To avoid serious health consequences in adulthood, the high incidence of psychopathology in this population needs to be addressed. Exercise has the potential to improve both physical and psychological health simultaneously; however, there is a lack of research investigating the effects of exercise upon psychopathology in obese young people. Therefore, this thesis provides an examination of the effects of a supervised exercise therapy intervention upon psychopathology related outcomes in obese adolescents using a randomised controlled trial (RCT) method. The primary trial hypothesis was that exercise therapy would lead to improvements in participants' physical self-esteem and reductions in psychopathology. Two qualitative studies explored obese adolescents' experiences of participation in an exercise therapy intervention and a further study investigated their ratings of perceived exertion (RPE) during exercise.

The population sample consisted of 81 obese (body mass index (BMI) >2.5 SDS, adult equivalent BMI of ≥ 30) adolescents aged between 11-16 years who had been referred to a children's hospital for evaluation of obesity or responded to a community advert. Participants were randomised to exercise therapy, an equal contact exercise-placebo intervention or usual care control. Intervention participants attended three one-to-one sessions per week, over eight-weeks and then completed a home programme for six-weeks. Participants were interviewed at the end of the eight-week intervention and again after the home programme. Outcomes included self-perceptions (self-esteem), depression, affect, physical activity and BMI. Repeated measures mixed analysis of covariance (controlling for baseline scores) revealed significant differences in physical self-worth, associated measures of self-esteem and physical activity over time in favour of the exercise therapy condition. There were no significant differences in BMI. Findings from the qualitative studies revealed that obese adolescents were happier than when they began the programme, expressed surprise at how much they were capable of achieving in terms of exercise and felt empowered to continue to exercise over the long-term. Some felt that the intervention was not long enough and many of the common barriers to exercise typically reported by other young people, such as time, were cited at interview. Obese adolescents reported RPE during exercise to be significantly greater for the lower limbs compared with aerobic exertion.

This study is the first RCT to demonstrate that a brief supervised exercise therapy intervention has the potential to significantly improve psychopathology related outcomes and increase physical activity in obese adolescents, relative to usual care. Findings indicate that obese children can successfully perform short intermittent bouts of structured exercise, given the opportunity, and that physical activity can contribute to the enhancement of their psychological and social well-being. Results also suggest that obese adolescents find prolonged bouts of exercise fatiguing in the lower limbs particularly which underlines the critical need for future interventions aimed at treating obesity to be aware of the importance of assessing ratings of perceived exertion during exercise. It is hoped that this thesis will generate additional research interest and concern about the psychopathology of young people who are obese. In particular, raise awareness of the importance of assessing the efficacy of obesity treatments in relation to psychopathology outcomes in future trials. It is also hoped that the exercise therapy guidelines provided here would inform health practitioners in the delivery of exercise therapy and highlight the potential contribution exercise therapy could make to the treatment of childhood obesity in pragmatic environments such as the NHS.

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Psalm 121: 1-2. A song of ascents

This has been the single most difficult journey I have ever undertaken. In truth, had I been fully aware of its nature from the outset, I doubt I would have even taken a single step. Most certainly, without the help of key individuals I would not have completed it. Therefore, I thank them publicly herein.

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PEER REVIEWED MATERIAL FROM THIS THESIS

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Daley, A. J., Copeland, R. J., Wright, N. P., & Wales, J. K. (2005). Protocol for: Sheffield obesity trial (SHOT): A randomised controlled trial of exercise therapy and mental health outcomes in obese adolescents [ISRCNT83888112]. *BMC Public Health [Electronic Resource]*, *5*, 113.

CONFERENCE AND RESEARCH PRESENTATIONS

Copeland, R. J., Daley, A. J., Wright, N. P., & Wales, J. K. (2004). Exercise therapy as a treatment for obesity. National Children's Bureau: Tackling the obesity epidemic: children first. March 2004.

Copeland, R. J., Daley, A. J., Wright, N. P., & Wales, J. K. (2005). Psychological and fitness characteristics of obese and morbidly obese adolescents. British Society of Pediatric Endocrinology and Diabetes. November 2005.

Copeland, R. J., Daley, A. J., Wright, N. P., & Wales, J. K. (2006). Children's Exercise Trials: UK and Overseas: Protocol for: Sheffield obesity trial (SHOT): Obesity & Health, Manchester. March 2006.

Copeland, R. J., Daley, A. J., Wright, N. P., & Wales, J. K. (2006). Exercise therapy as a treatment for psychopathologic conditions in obese and morbidly obese adolescents: A randomized controlled trial. UK convention on the treatment and prevention of childhood obesity: Leeds Metropolitan University. August 2006.

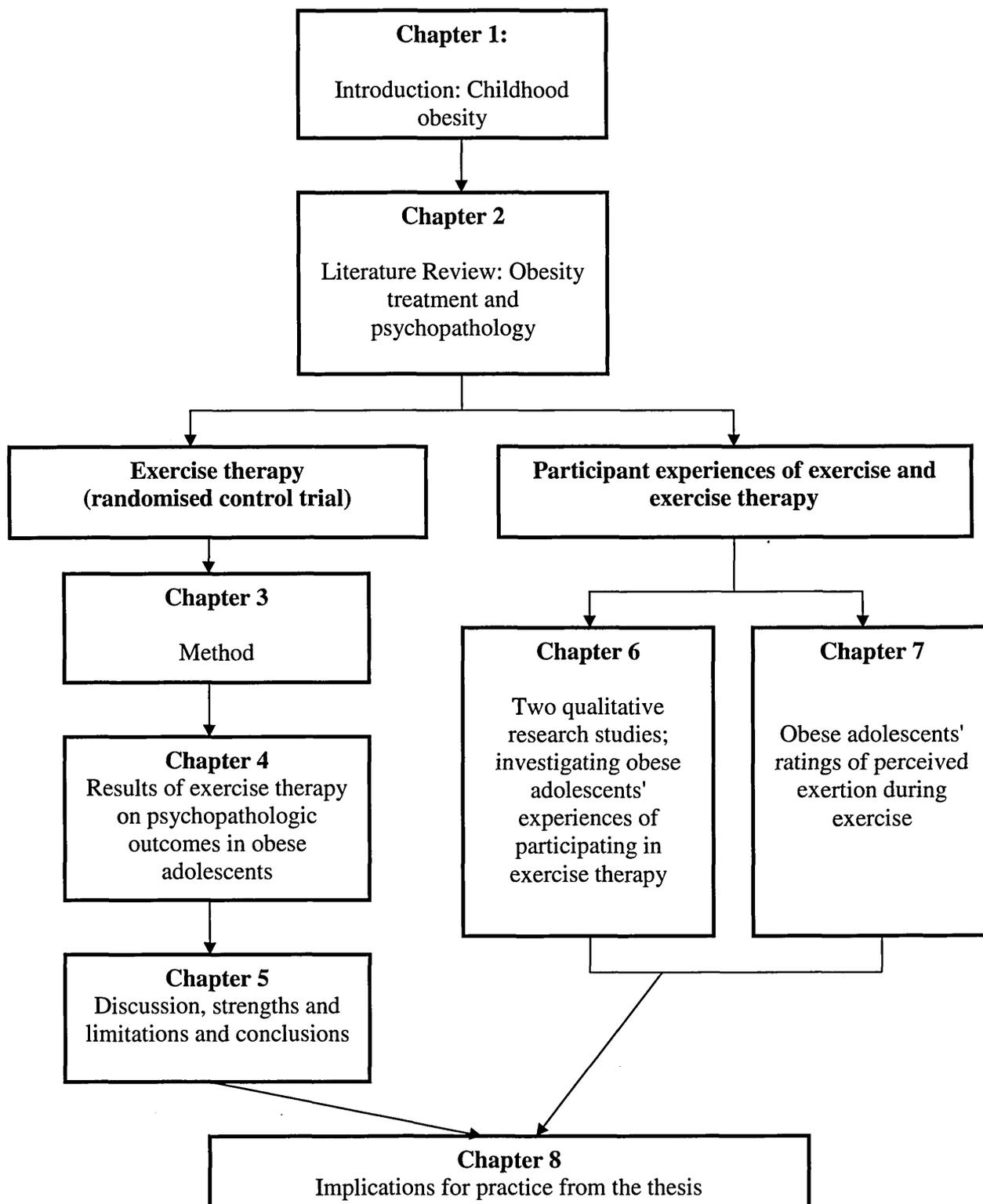
Copeland, R. J., Daley, A. J., Wright, N. P., & Wales, J. K. (2006). Lower limb versus aerobic ratings of perceived exertion in clinically obese adolescents. British Association of Sport and Exercise Science. September 2006.

STRUCTURE OF THE THESIS

PURPOSE OF THE THESIS

A global epidemic of paediatric obesity has occurred in recent years, and prevalence of obesity in young people is continuing to rise (Reilly, 2006). While the physiological consequences of obesity are often reported, the psychological consequences of this condition have received limited attention in the literature. Overweight adolescents are more likely to be socially isolated, bullied and peripheral to social networks compared to their normal weight counterparts (Morgan, Tanofsky-Kraff, Wilfley & Yanovski, 2002). Furthermore, weight status has been consistently associated with high depressive symptoms and suicidal ideation in obese young people (Mellin, Neumark-Sztainer, Story, Ireland & Resnick, 2002). Collectively, these findings have created a need for clinicians and researchers to address issues that are related to the long-term well-being of clinically obese young people. Without intervention, the high incidence of psychopathology amongst obese and overweight children (Mellin et al., 2002; Puhl & Brownell, 2003; Zimetkin, Zoon, Klein & Munson, 2004) can persist into adulthood diminishing quality of life and psychosocial health. Exercise interventions could be particularly appropriate treatments in obese populations since they have potential to improve both physical and psychological health simultaneously. Therefore, the purpose of this thesis was to investigate the use of exercise therapy as a treatment intervention for obesity, with a particular focus on psychopathologic outcomes, in obese adolescents. Adopting a qualitative method, the thesis also provided insight into the exercise experiences of obese young people.

FLOW DIAGRAM OF THE THESIS



CONTENT OF THE THESIS

Chapter one

Chapter one describes the scale of the obesity epidemic and examines the impact of the disease on the physical and psychological health of obese young people. The risk factors associated with becoming obese and the potential causes for the epidemic are also explored.

Chapter two

Chapter two provides a critical overview of different approaches to obesity treatment in children and adolescents. Particular attention is given to those interventions that have included psychopathologic outcomes and/or adopted exercise as a mode for treatment. Chapter two also describes the theory underpinning exercise therapy.

Chapter three

Chapter three describes the procedures for the main randomised controlled trial that was undertaken to evaluate the effects of a supervised exercise therapy intervention upon psychopathologic outcomes in obese adolescents.

Chapter four

Chapter four describes and presents the outcomes from the randomised control trial.

Chapter five

Chapter five presents a brief synopsis of the key findings from the main randomised controlled trial. Consideration of possible mechanisms and explanations of the findings are also offered. The main trial results are also compared with relevant findings from previous related literature and the particular strengths and limitations of

the study are outlined. Chapter five presents final conclusions drawn from the main trial results.

Chapter six

Chapter six comprises two studies. Study one explored obese adolescents' experiences of participation in an exercise therapy intervention. Study two explored obese adolescents' experiences of maintaining positive health behaviours after the intervention. Both of these qualitative studies were nested within the main randomised controlled trial.

Chapter seven

The exercise experiences of obese adolescents in terms of perceived exertion are explored in the study described in chapter seven. This study constituted part of the baseline assessments of the main trial and provides further insight into the exercise experiences of obese young people.

Chapter eight

Using evidence from the main trial, the qualitative research studies, the ratings of perceived exertion study and personal reflections and experiences, chapter eight presents practical suggestions regarding the implementation of exercise therapy as a treatment for young people who are obese.

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1.0. INTRODUCTION

1.1. EPIDEMIOLOGY OF CHILDHOOD OBESITY

Childhood obesity has reached epidemic proportions globally (Wang & Lobstein, 2006). Worldwide, over 155 million school-age children are severely overweight (British Medical Association: BMA, 2005) with the highest rates of childhood obesity observed in developed countries (Dehghan, Akhtar-Danesh & Merchant, 2005). The number of young people who are overweight and obese in Britain has almost tripled in the past 20 years (Lobstein, James & Cole, 2003) as it has in the United States (Hedley, Ogden, Johnson, Carroll, Curtin & Flegal, 2002) and accelerated notably over the past decade (Chinn & Rona, 2001). In 1996 in the UK, 9.6% of all children were obese; by 2003 this figure had risen to 13.7% (National Audit Office: NAO, 2006). In the United States, as of 2002, approximately 30% of children were overweight and more than 15% of children were obese (Hedley et al., 2002). Increases in obesity amongst adolescents have been most prominent with obesity rising from 14% in boys and 15% in girls' aged 11-15 in 1995 to 24% and 26% respectively by 2004 (Department of Health, 2004a). A longitudinal study (Wardle, Brodersen, Cole, Jarvis & Boniface, 2006) of an ethnically and socio-economically diverse sample of young people in Britain confirmed obesity trends identified from national statistics (DoH, 2004b) and further highlighted that obesity rates are high and rising. Central obesity seems to be increasing particularly rapidly and the notion of 'puppy fat' that disappears upon maturation must be abandoned (Wardle et al., 2006). There is great concern locally with over 1500 children being classed as obese in Sheffield and of those some 600 are at major risk of serious health problems (Baddeley, 2002).

1.2. IMPACT OF OBESITY ON PHYSICAL HEALTH

Childhood obesity is associated with several risk factors for later heart disease and other chronic diseases including diabetes, respiratory disease and adult obesity as well as orthopaedic disorders (Mei, Scanlon, Grummer-Strawn, Freedman, Yip & Trowbridge, 1998). In addition to the increased risk of poor health in later life, obese children face immediate health consequences. Abnormal lipid profiles, elevated blood pressure (Freedman, Dietz, Srinivasan & Berenson, 1999) increased asthma prevalence (von Mutius, Schwartz, Neas, Dockery & Weiss, 2001) and greater risk of type II diabetes mellitus (Fagot-Campagna, Narayan & Imperatore, 2001) are indicative of the disease. Type II diabetes mellitus is now the most common type of pediatric diabetes diagnosed in several pediatric diabetes centres (Ehtisham, Barrett & Shaw, 2000). There is also evidence that children with a Body Mass Index (BMI) over the 99th percentile can die of sudden cardiopulmonary arrest apparently caused by arrhythmias associated with their obesity (Styne, 1999).

1.3. IMPACT OF OBESITY ON PSYCHOSOCIAL HEALTH

While the physiological consequences of obesity are often reported, the psychopathology of this condition has received limited attention in the literature. Overweight children have increased odds of experiencing poor psychosocial health, low self-esteem and impaired physical functioning (Friedlander, Larkin, Rosen, Palermo & Redline, 2003). Childhood obesity is associated with several psychopathologic conditions such as depression, suicidal thoughts and suicide attempts (Mellin, Neumark-Sztainer, Story, Ireland & Resnick, 2002; Puhl & Brownell, 2003; Zimetkin, Zoon, Klein & Munson, 2004). Severely obese children and adolescents have reported similar low quality of life scores as peers diagnosed with cancer (Schwimmer, Burwinkle & Varni, 2003). Obese children, independent of their help-seeking status, have also reported greater negative physical self-perception than their non-obese peers and scored lower on measures of general self-worth (Braet, Mervielde, & Vandereycken, 1997). Obese children are often teased and are targets of bullying (Morgan,

Tanofsky-Kraff, Wilfley & Yanovski, 2002; Zimetkin, et al., 2004). As a result many lack self-esteem or confidence (Swallen, Reither, Haas & Meier, 2005). This can have a profound effect on childhood psychological development (Morgan et al., 2002; Puhl & Brownell, 2003). Studies indicate that obese adolescents tend to be peripheral to social networks, experience verbal, physical and relational bullying (withdrawing friendship, spreading rumours or lies) (Strauss & Pollack, 2001) and are more likely to be victimised by their peers than their normal-weight counterparts (Janssen, Craig, Boyce & Pickett, 2004).

Children from low socio-economic backgrounds have a greater risk of obesity than children in more affluent households (Parsons, Power, Logan & Summerbell, 1999). Inequalities exist in the consumption of fruit and vegetables, with lower consumption among children from lower socio-economic households. Furthermore, opportunities to exercise in areas of socio-economic deprivation might also be restricted (British Medical Association [BMA], 2005). Although confined to data from the adult population, obesity is linked to lower educational achievement and intelligence, lower income, and poorer job chances (Power, Lake & Cole, 1997). Such trends highlight the potential negative effect of obesity on quality of life (QoL) and psychological health and establish an important link between childhood/adolescent obesity and experiences in later life.

1.4. ECONOMIC COST OF OBESITY

The economic cost of obesity in England is estimated to be £2.1 billion per annum (National Audit Office [NAO], 2006), with the specific cost of treating obesity within the National Health Service (NHS) in the region of £1 billion. Estimates suggest that by 2010, the total (direct and indirect) cost to the NHS and wider economy will be around £3.6 billion (NAO, 2006). For those who are already obese, even a modest weight loss can have substantial benefits. A 10 kg loss is associated with a 20% fall in total mortality and a 10% reduction in total cholesterol. Estimates suggest that one million fewer obese people in the UK could lead

to a reduction of around 15,000 coronary heart disease cases, 34,000 fewer type II diabetes incidences, and 99,000 fewer people with high blood pressure (Reilly & Dorosty, 1999).

1.5. OBESITY RISK FACTORS

Paediatric obesity often persists into adulthood with 50% of obese adolescents remaining obese as adults (Steinbeck, 2001). It has been reported that the more severe and earlier the onset of paediatric obesity, the more profound adult obesity (Schonfeld-Warden & Warden, 1997). Data from the adult population suggests a variety of factors influence individuals' risk of becoming obese. In adults, age, sex, ethnicity and social-economic class are all cited as being important contributing factors (DoH, 1999). Socio-economic status and ethnicity have also been implicated as risk factors for obesity in adolescents (Parsons, Power, Logan & Summerbell, 1999). Wardle and colleagues (2006) found that obesity rates were higher in lower socio-economic status areas with ethnic differences evident and particularly strong amongst black girls. Furthermore, age was also cited as an important factor; the existence of excess adiposity at 11 was highly likely to be present later in adolescence.

Obesity has been associated with familial patterns and behavioural relationships. Several cross-sectional (Danielzik, Czerwinski-Mast, Langnase, Dilba & Muller, 2004; Sekine, Yamagami, Hamanishi, Handa, Saito & Nanri, 2002) and longitudinal studies (Strauss & Knight, 1999) have demonstrated that boys are over six and a half times more likely to be overweight or obese if both parents were obese. Similarly, girls were about seven times as likely to be overweight or obese if both parents were obese. Keller and Stevens (1996) have reported that children had an 80% chance of becoming obese if both parents were obese, and a 40% chance of becoming obese if one parent was obese. When neither parent was obese, the odds were reduced to 7%.

1.6. CAUSES OF OBESITY

The rapid rise in obesity suggests that genetic factors are not the primary cause (BMA, 2005). Rather, it has been suggested that the creation of an 'obesogenic' environment (Swinburn & Egger, 1997) for example, an environment which encourages high-energy intake, is partially to blame. In the UK over the past 50 years, there has been an increase in the proportion of fat in the diet. More foods with higher fat contents are now available (Prentice & Jebb, 1995) which has serious implications given children and adolescents appear to have a preference for high-fat content diets (Ministry of Agriculture, Fisheries and Foods & DoH, 2000). There is also concern that children are consuming too much sugar (BMA, 2005). Carbonated drinks, sweets and chocolate are the top three sources of non-milk extrinsic sugars in children's diets and consumption of fizzy drinks has almost doubled in the past decade with young adults now drinking a mean of six cans each week (DoH, 2002). However, there is evidence that obesity is not caused by overeating. Mean energy intake has declined by 20% since 1970 (Ministry of Agriculture et al., 2000) and The National Diet and Nutrition Survey (NDNS) of young people in Britain aged 4–18 years (Gregory et al., 2000) found that mean energy intakes were lower than the estimated average requirement, suggesting that the rapid increase in obesity is not exclusively a result of changes in energy intake but is at least partially attributable to a concurrent fall in energy expenditure.

There is concern that children and adolescents are not engaging in sufficient physical activity to achieve and retain good health (Cooper, Andersen, Wedderkopp, Page & Froberg, 2005; Riddoch, Bo Andersen, Wedderkopp, Harro, Klasson-Heggebo & Sardinha, 2004). The DoH "At least five a week" report (2004c) documented that only 16% of boys and 10% of girls participated in exercise or sport on at least five days a week. Guidelines suggest all young people aged 5-18 years should participate in physical activity of at least moderate intensity for one hour a day (DoH, 2004c). Given that physical activity appears to decline with age

(Hardman & Stensel, 2003), a continued rise in child obesity appears inevitable. Television viewing and other sedentary behaviours such as video games and internet usage are thought to compete with physical activity (French, Story & Jeffery, 2001) and therefore contribute to a decline in activity in adolescents. However, there is some evidence (Marshall, Gorley & Biddle, 2006) that total media-use, and television viewing in particular, has remained stable over the past 50 years. Despite this plateau, reallocating small amounts of sedentary time in favour of more active behaviour has been shown to impact on energy balance and fitness (Epstein & Roemmich, 2001a). Given that obese young people are more likely to choose sedentary activities even when physically active alternatives are freely available (Epstein, Smith, Vara & Rodefer, 1991; Vara & Epstein, 1993), the biggest challenge is likely to be in engaging obese children and adolescents in physical activity in the first instance. Motivating obese children to exercise cannot be achieved in the same way as children of normal weight (McWhorter, Wallmann & Alpert, 2003), not only are obese children physiologically different from children of normal weight, they have demonstrated marked emotional differences (Sothorn et al., 1999). If physical activity is to be a central construct in preventing and treating childhood obesity, it is important that interventions are designed to address these differences.

1.7. AIMS OF RESEARCH

The high incidence of psychopathology amongst obese and overweight children (Mellin et al., 2002; Puhl & Brownell, 2003; Zametkin et al., 2004) needs to be addressed to avoid serious health consequences in adulthood (Mei et al., 1998). Exercise interventions could be particularly appropriate treatments in obese populations since they have potential to improve both physical and psychological health simultaneously. It is the purpose of this study to investigate the use of exercise therapy as a treatment intervention for obesity with a particular focus on psychopathology outcomes in clinically obese adolescents.

2.0. REVIEW OF LITERATURE

2.1. TREATMENT OF CHILDHOOD OBESITY

There is considerable research interest in the treatment of childhood obesity. However, the evidence-base for quality treatment and prevention strategies is limited (Reilly & McDowell, 2003). Whilst the use of dietary restriction, physical activity, and behavioural therapy have all been adopted as possible treatment strategies there is much debate between researchers as to which is most effective in reducing obesity (Gately, Cooke, Butterly, Knight & Carroll, 2000). Furthermore, studies have tended to focus on the poor physical health associated with the disease, despite childhood obesity increasing the likelihood of psychopathology, particularly in relation to emotional and social problems (Zametkin et al., 2004). To date, research addressing the psychopathology of childhood obesity as a primary outcome has largely been ignored. The following chapter offers succinct critical appraisal of the current evidence-base for childhood obesity treatment interventions that have a particular emphasis on physical activity and/or psychopathologic outcomes.

2.12. Rationale for summaries of intervention studies for the treatment of childhood obesity

Whilst the treatment of childhood obesity is receiving growing research interest, studies often focus on investigating physical health variables and are limited by sample size, follow-up and/or method (Summerbell, Ashton, Campbell, Edmunds, Kelly & Waters, 2003). A recent systematic review only included 18 studies in the final analysis and concluded that there is a limited amount of quality data on the components of programmes to treat childhood obesity (Summerbell et al., 2003). Studies reviewed here in Table 2.1 have been selected based on the criteria outline by the Cochrane Library systematic review (2003) and/or their relevance to the treatment of obesity related psychopathology.

Table 2.1. Summaries of intervention studies for the treatment of childhood obesity

Author, Design, Location	Population	Purpose	Protocol	Results	Comments
Barton, Walker, Lambert, Gately & Hill 2004	61 UK Obese adolescents; age, 14.1 (+/-0.2) years; BMI, 33.9 (+/-0.7 kg/m ²).	To investigate how obese adolescents think about themselves in terms of exercise, eating, and appearance and whether these cognitions change over the course of a residential weight loss camp.	Assessments of body weight, height and self-esteem and a sentence-completion test eliciting thoughts and beliefs about exercise, eating, and appearance at the start and end of the camp (mean stay, 26 days). They were compared with a single assessment of 20 normal-weight adolescents (age, 15.4 (+/-0.2) years; BMI, 21.8 (+/-0.5 kg/m ²).	The obese adolescents lost 5.7 kg and reduced their BMI SD score by 0.25. Camp residence was associated with a reduction in negative automatic thoughts and an increase in positive exercise and appearance thoughts.	Obese adolescents not only lost weight, but they improved their self-representation, specifically in terms of automatic thoughts about exercise and appearance. Including BMIs change as a covariate took away the entire main and interaction effects of time, showing that cognitive change was largely accounted for by the reduction in weight.
Residential Weight loss camp UK				There was no change in conditional beliefs, either functional or dysfunctional.	Highlights potential danger of focusing on weight loss during intervention programmes.
Brownell, Kelman & Stunkard, 1983 RCT USA	42 overweight adolescents, aged 12-16 years.	To test three methods of parent involvement in the treatment of obese adolescents aged 12 and 16 years. Short-term and long-term changes in weight and blood pressure were assessed at the end of a 16-week treatment period and at the end of a one-year follow-up.	Mother-Child together versus Mother-Child separately versus Child alone. All groups received diet, exercise and social support instruction.	Percent overweight and body mass index changes were significantly greater in the Mother-Child separately group compared to other groups at 16 weeks and at one year.	Highlights age difference with behavioural approach and family therapy.

Author, Design, Location	Population	Purpose	Protocol	Results	Comments
DeWolfe & Jack 1984 RCT Canada	18 adolescent girls, recruited from a student population, aged 14-20 years.	Lifestyle approach in a study that examined the reinforcement of behavioural, diet and exercise strategies.	Eight-week weight reduction programme, two sessions per week, one session on theory and practice of physical education, one session behavioural control of eating and diet therapy. After the initial eight weeks, randomised to three groups, Group one monthly behavioural, diet and exercise reinforcement. Group two no reinforcement techniques were used. Group three; control.	No tests of significance are reported; however, mean weight loss for the group receiving monthly reinforcement was 3.7kg during the one-year follow-up compared to a mean loss of 1.9kg for the group undergoing monthly physical measurements alone. Participants with no monthly contact had a mean weight gain of 3.44kg at the one-year follow-up.	Random allocation: Method not described. The results suggest that regular follow-up may be a critical element in successful weight control programs for adolescent girls.
Epstein, Wing & Koeske 1984 RCT USA	53 families 8-12 years baseline 47 families (89%) at 6 months; 34 families at one year (64%)	Comparison of diet with diet-plus-life-style exercise.	Families assigned to three groups: diet, diet plus lifestyle exercise and waiting list control. Eight-weekly, three bi-weekly and four monthly meetings. Traffic light diet and point economy system. Duration was six months with 12 month follow-up.	Both treatment groups had significantly lower BMI at six-months than control group and significantly lower than baseline. No significant differences between treatment groups at six-months or one-year.	Changes in BMI short term (<12months). Mechanisms for long-term change in children are different from those of short term changes.

Author, Design, Location	Population	Purpose	Protocol	Results	Comments
Epstein, Wing, Penner & Kress 1985a RCT USA	22 families, 23 overweight children, aged eight-12 years.	To re-evaluate the role of exercise plus diet in weight control by having children participate in a structured exercise program during the first six weeks of exercise, which may facilitate the development of appropriate exercise behaviour.	Participants were randomised to two groups: diet only and diet plus six weeks of structured exercise. Traffic light diet. Self monitoring, modelling contracting. Subjects attended eight weekly intensive plus ten monthly maintenance sessions with child and parent(s) treated separately. Duration: 12 months	Significant differences in weight and % overweight at 6 months with diet plus exercise vs. diet only. Both groups reduced weight and % overweight significantly at two and six-months. Only diet plus exercise reduced weight significantly at 12 months; both groups reduced %overweight at 12 months.	During the 2nd year follow-up, the lifestyle exercise group maintained the weight loss while callisthenics and aerobic exercise, groups gained significant amounts of weight. Although the study included a behavioural component, the impact of such techniques was not explored. Deposit of \$80 before treatment, with \$20 being refunded based on attendance criteria, has implications for motivation.
Epstein, Wing, Koeske & Valoski 1985b RCT USA	35 families; 21 girls & 14 boys, 8-12 years.	Assessed the reliability of the effects of diet plus lifestyle versus diet plus programmed aerobic exercise over an extended two-year observation interval.	Families randomised to three groups: diet plus programmed aerobic exercise, diet plus lifestyle, and diet plus callisthenics. Eight-weekly and ten-monthly sessions. Traffic light diet; Self-monitoring, modelling, contingency and contracting and parent management. Duration: 12 months with a 24 month follow-up.	Significant decreases in % overweight at two, six & 12 months in all. No difference in % overweight at 12 months between groups. At 24 months only lifestyle group maintained relative weight changes in % overweight. At the ten-year follow-up; lifestyle achieved significant change in % overweight compared to callisthenics control group.	Exercise enhanced the outcome of the short-term treatment of childhood overweight and helped improvements in fitness when compared to diet-only approaches. No assessment of dietary compliance. Small group size. Lack of demographic information. Reasons for withdrawal and numbers that withdrew not described.

Author, Design, Location	Population	Purpose	Protocol	Results	Comments
Epstein, Valoski, Wing & McCurley 1990 RCT USA	55 of the 76 families with overweight children enrolled initially in the study (72% retention).	To target and reinforce habit change and weight loss in obese parents and children. To assess whether treatment for childhood obesity during developmental periods when the child is growing will influence final weight.	Eight-weekly treatment and six-monthly meetings. Families in three groups: child and parent target, child target, or non-specific target (control); Traffic light diet, exercise (aerobic and stretching); contracting, self-monitoring, social reinforcement, and modelling; contingency management.	Children in the child & parent group showed significantly greater decreases in % overweight after five (-11.2%) and ten (-7.5%) years than children in the non-specific control group (+7.9 and +14.3%, respectively). Children in the child only group showed increases in % overweight after five (+3%), 10 (+4.5%) years.	No intent to treat analysis with limited generalizability (all intact, middle class, white families); Could not tell the number of children that were not overweight at end of study (due to missing figure?); Said 'identical' education, but some differences between one, two vs. three (in terms of behavioural procedures), Subject compliance with training or meeting attendance not described.
Epstein Valoski, Kalarchian & McCurley 1995a RCT USA	113 families eight-12 year old children: 81 female, 32 male parents: 85 female, 28 male.	Investigate the role of parent weight in the treatment of childhood obesity. Evaluation of self-control on childhood weight control.	Weekly treatment meetings for eight-weeks followed by monthly meetings for six-12 months; 1200-1500 and Traffic Light Diet (TLD). Duration: six months with ten year follow-up.	Significant differences in percentage of children versus adults who had decrease of at least 20% overweight at six, 60 and 120 months.	Lack of control plus Withdrawals /dropouts were not specified Differences in child and adult weight loss and maintenance may be due to behavioural or biological factors that favour child weight control.
Epstein et al., 1995b RCT USA	92 families screened, 61 enrolled, overweight children, eight-12 years.	To compare the effects of reinforcing children for increasing physical activity vs. reducing time spent being sedentary vs. the combination of both on child weight control.	Weekly meetings for four months, two-monthly meetings thereafter; TLD + physical activity & reductions in sedentary activity. Duration: four months with 12 month follow-up.	Significant differences between groups in % overweight at four-months. At 12 months, reducing sedentary activity significantly < physical activity.	Results support the goal of reducing time spent in sedentary activities to improve weight loss. Sample size per group is unclear with no comparison group.

Author, Design, Location	Population	Purpose	Protocol	Results	Comments
Epstein, Paluch, Gordy, Saelens & Ernst 2000 RCT USA	398 families replied to advertisement, 162 families were screened and 67 met entrance criteria. Final sample: 62 families with 62 parents and 62 overweight children, eight-12 years.	To determine the effects of adding problem-solving training for parents and children or children alone to a comprehensive family-based behavioural childhood obesity treatment. Also to provide information on the long-term changes in child psychological problems in children provided family-based behavioural weight-control treatment.	Randomised to Problem solving parent and child; problem solving child only; and no problem solving. Weekly meetings for four months plus two monthly meetings. Followed by monthly meetings for six-months in which child and parent were counselled separately and provided workbooks for home use. Lifestyle exercise with workbooks. Preplanning, self-monitoring, stimulus control, positive reinforcement.	No significant differences in BMI z score between groups at six-months (all decreased). At 24 months problem solving parent and child significantly reduced BMI z score compared to both problem solving to child and control.	Unclear sample size (62 or 52?), no blinding of measurements, not clear if problem solving training impacted problem solving ability as measure of such did not appear to differ by group or if problem solving is effectively (but not intentionally) learned in standard treatment protocol.
Flodmark, Ohlsson, Ryden & Sveger, 1993 RCT Sweden	94 overweight children, 10-11 years.	To evaluate the effect of family therapy on childhood obesity.	Participants either control, conventional treatment (CT) or Family therapy (FT). Treatment groups- dietary counselling (1500-1700 kcal diet) and medical checkups for 14-18 months. FT included self-monitoring, stimulus control, nutrition education, cognitive restructuring and physical activity.	Family group had a significantly lesser increase in BMI than CT group and greater decrease in skin folds at the end of treatment. BMI was significantly lower in the FT compared to control at one year. BMI did not significantly differ between family and CT or controls and CT at one-year.	Family based therapy in broad terms may slow the increase in BMI, doesn't reduce it.

Author, Design, Location	Population	Purpose	Protocol	Results	Comments
Gately, Cooke, Butterly, Knight & Carroll, 2000	194 children (64 boys and 130 girls, aged 12.6+/-2.5y) enrolled at a USA summer weight loss camp.	To assess the long-term effects of a multidisciplinary approach involving structured fun-type skill learning physical activities in the treatment of obese and overweight children.	A longitudinal investigation incorporating repeated measurements before and after the Eight-week intervention. The camp programme (USA) utilised structured fun-based skill learning physical activities, moderate dietary restriction and behaviour modification. Aimed to reduce body mass using an alternative to standard exercise prescription.	Eight-week intervention showed reductions ($p<0.01$) in mean body mass, BMI and waist circumference.	These findings suggest that the use of a structured fun-based skill-learning programme may provide an alternative method of exercise prescription to help children prolong the effects of the eight-week intervention. Methods non-randomised and results limited to USA populations.
Residential Weight loss camp USA Children	102 children (38 boys and 64 girls aged 13.6+/-2.4y) returned 1 year later.				
Gately et al., 2005	185 overweight children compared with 94 children of similar ages i.e., 38 overweight children and 56 normal-weight children.	This study evaluated the effectiveness of a residential weight-loss camp program for overweight and obese children.	The intervention group attended a six-week (maximum) summer residential weight-loss camp. The program included a daily schedule of six one-hour, skill-based, fun, physical activity sessions. Body weight, height, and other anthropometric measures, blood pressure, aerobic fitness, self-esteem, and selected sports skills.	Campers, who stayed for a mean of 29 days, lost 6.0 kg, reduced their BMI by 2.4 units, and reduced their BMI SD scores by 0.28.	In the short term at least, this weight-loss program was effective across a range of health outcomes. Future research should investigate whether benefits can be generalised across weight-loss camps and how the intervention can be adapted to non-residential, term-time settings.
Residential Weight loss camp USA & UK				Camp attendees also showed significant improvements in blood pressure, aerobic fitness, and self-esteem. Longer durations of stay were associated with greater improvement in outcomes.	

Author, Design, Location	Population	Purpose	Protocol	Results	Comments
Golan, Fainaru & Weisman, 1998a RCT Israel	60 overweight children, 6-11 years of age.	To compare the efficacy of a family-based approach for the treatment of childhood obesity, in which the parents served as the exclusive agents of change, with that of the conventional approach, in which the children served as the agents of change.	Subjects were randomised to two groups: Parent only behavioural sessions, four-weekly followed by four biweekly and then six every sixth week versus child only diet and physical activity instruction, eight-weekly followed by bi-weekly sessions for ten-months. Both groups taught by a registered dietician.	29 (97%) families in the parent only group behavioural instruction and 21 (70%) in the child diet and physical activity instruction completed the study. Both groups significantly reduced % overweight at 12 months. Children in the parent only group had a significantly greater reduction in % overweight at 12 months.	Methodology lacked full description. Blinding of children and investigators not clarified.
Graves, Meyers & Clark, 1988 RCT Location not specified	40 overweight children, six-12 years.	To attempt to determine if structured parental problem-solving training would facilitate child weight loss in a family-oriented weight reduction program.	Children assigned to three groups: behavioural, problem solving, or instruction-only. All groups attended eight-weekly 60-minute sessions. Traffic light diet and self-monitoring of food and activity in all groups.	Children in problem solving and behavioural groups decreased weight, % overweight and BMI significantly at eight-weeks. Significant differences were maintained at three and six-month follow-up. Only children in the problem-solving group maintained significant differences in % overweight and BMI at six-months.	Lack of demographic information in intervention study. Subjects, clinicians, practitioners, & investigators weren't blinded. No control for experimenter effect.

Author, Design, Location	Population	Purpose	Protocol	Results	Comments
Gutin & Owens 1999 RCT USA	81, 7-11 years obese children were recruited to the study, with 73 completing the course.	Focused upon outlining strategies to maintain high attendance and participation with obese children.	Children randomly assigned to two groups; one group underwent physical training during the first four-months and the second underwent training during the next four-months. Children participated in physical training games skill levels. Energy expenditure estimated from heart rate and minutes exercising.	A mean reduction in percentage fat of 1.6 was reported after the four-month physical training period. Vigorous physical activity increased significantly, however this was offset by a reduction in free-living activity.	A high maintenance rate was also noticed, although this is perhaps a direct result of the transport provided for each session as opposed to a real change in exercise habit. No dietary intervention was used.
Israel, Guile, Baker & Silverman 1994 RCT USA	36 families with overweight children, eight-13 years. female/male not specified.	Assessment of a multi-component obesity treatment programme on cardiovascular risk factors.	Families randomised to either standard treatment (ST) or enhanced child involvement (ECI). Both groups followed four-component model of self-regulation, including goal setting, self-monitoring, self-evaluation, and self-consequation for eight-weekly 90-minute sessions and nine-biweekly sessions. ST emphasized parent responsibility; ECI focused on children's management of own weight loss efforts.	All groups significantly decreased % overweight and triceps skin folds at six-months, % overweight increased above post-treatment levels in all groups at three-year follow-up.	Behaviourally oriented treatment program. Methodology lacked full description. Longitudinal findings suggested promotion of an enhanced child involvement approach.

Author, Design, Location	Population	Purpose	Protocol	Results	Comments
Mellin, Slinkard & Irwin, 1987 RCT USA	66 overweight children 52 female, 14 male ages 12-18.	The "Shapedown" programme is based on a number of cognitive, behavioural, affective and international techniques, encouraging the adolescents to make successive, sustainable, small modifications in diet, exercise, relationships, lifestyle, communications, and attitudes.	Subjects randomly assigned to Shapedown program (90 minute weekly sessions for 14 weeks). Shapedown programme (n=37, relative weight 136.5%) consisted of - self-directed change encouraging adolescents to make sustainable small modifications in diet, exercise, lifestyle and attitudes vs. no treatment control (n=29, relative weight 129.5%). Three-month intervention, one-year follow-up.	At three-months and 15 months Shapedown group (-9.9%) had significantly reduced relative weight compared to control group. At six-months both Shapedown and control group reduced relative weight significantly.	Based fundamentally on behaviour change techniques. Method poorly described so difficult to determine what actually occurred. Blinding of children and investigators unclear.
Schwingshandl, Sudi, Eibl, Wallner & Borkenstein 1999 RCT Austria	30 overweight children. 17 female, 13 male. Mean age for Group A: 11.0 years. Mean age for Group B: 12.2 years.	To evaluate a standardised training program for maintenance of fat free mass during weight reduction. To study the effect of changes in fat free mass during weight reduction on the long-term outcome.	Subjects were randomly assigned to two groups: with individualised exercise training twice per week and without exercise group. Both groups received standard dietary advice with visits at four, eight and 12-weeks. Duration: 12-weeks.	BMI-SDS was significantly decreased in both groups. Weight was not significantly reduced in either group. FFM increased significantly in exercise group but not without exercise group and change was significantly different between groups.	Standardised training program can prevent reduction in FFM during weight loss in obese children. Reduction in FFM during weight reduction might be risk factor for regain of weight.

Author, Design, Location	Population	Purpose	Protocol	Results	Comments
Stella, Vilar, Lacroix, Fisberg, Santos, Mello & Tufik, 2005	The sample consisted of 40 female subjects (mean age 16 ± 1.56 years). Participants had a body mass index of 95% or more in relation to the 50th percentile.	The purpose of the present study was to examine the possibility of reducing depression inventory scores in female adolescents with third-degree obesity while testing the effectiveness of different exercise programs in reducing anxiety and depression scores.	Aerobic training vs. anaerobic training vs. leisure activities vs. control. Aerobic: three ergometric bicycle sessions per week over 3-months. Anaerobic: was based on the Wingate test. Leisure: varied range of activities (games, exercises, etc.). Nutrition support.	Significant reduction for depression scores only for aerobic exercise (18.9 ± 9.33 to 10.6 ± 9.56 or 43.9%) but no significant alterations for anaerobic exercise (11.36 ± 5.23 to 9.63 ± 4.78 or 15.22%) and leisure (17.28 ± 7.55 to 15.07 ± 7.54 or 12.78%).	Method of allocation not described. Methods lacked detail which made it difficult to determine exactly what occurred; also the impact of the nutritional component was not assessed. Training methods adopted unlikely to be sustainable or enjoyable for children. Adult measure of depression.
Walker, Gately, Bewick & Hill, 2003	A total of 57 obese adolescents (age: 13, 11; BMI: 32.6 kg/m (2)) and 38 normal weight comparison adolescents.	To investigate the change in body image, self-esteem, and worries in obese adolescents attending a residential, weight-loss camp.	A longitudinal intervention study, with a non-intervention comparison group of lean adolescents. Self-esteem, salience of weight-related issues, body shape preference, weight and height at the start, and end of the weight-loss camp (mean stay: four-weeks).	Obese adolescents lost 5.6 kg, reduced their BMI by 2.1 kg/m ² , and BMIs by 0.28 while comparison children gained weight. Body shape dissatisfaction significantly decreased and self-esteem increased for global self-worth, athletic competence, and physical appearance, in the camp attendees. No exacerbation of existing worries about appearance or weight.	While obese adolescents had lower self-worth and greater body dissatisfaction relative to the comparison children at the start of the camp, the intervention improved their psychological state. Greater weight loss was associated with greater psychological improvement, indicating the value of the intervention and the relevance of psychological change in effective treatment.
Residential Weight loss camp UK					

2.2. EXERCISE & PHYSICAL ACTIVITY INTERVENTIONS FOR THE TREATMENT OF CHILDHOOD OBESITY

The health benefits of a physically active lifestyle are well documented (Chakravarthy, Joyner & Booth, 2002). In the adult population, regular activity of even moderate intensity is related to a reduced incidence of type II diabetes mellitus, obesity, cardiovascular disease, many types of cancer, and osteoporosis (DoH, 2004). Several studies have reported a positive association between exercise and physiological outcomes in the obese population (Marks, Ward, Morris, Castellani & Rippe, 1995; Saris, 1993; Schwingshandl, Sudi, Eibl, Wallner & Brokenstein, 1999) and there is some limited evidence that physical activity has a positive influence on reducing cardiovascular disease (CVD) risk in youth (Biddle, Gorley & Stensel, 2004). Although weight loss directly attributable to increased physical activity is small, physical activity further enhances negative energy balance and might preserve fat-free mass usually lost during dietary restriction (Sothorn, Schumacher, von Almen, Carlisle & Udall, 1999). In addition, increasing the energy expenditure of obese children through physical activity could facilitate weight change and positively impact on mental health (Wadden, Brownell & Foster, 2002)

2.21. Treatment intervention designs

Interventions for prevention and treatment of childhood obesity typically target increases in physical activity (Reilly & McDowell, 2003). However, evidence for the most effective types of exercise programme for improving and altering body composition in obese children/adolescents is limited (Maziekas & LeMura, 2003). Moreover, given that physical activity in children is declining (DoH, 2004) and obese children have shown to be significantly less physically active than their non-obese counterparts (Page, Cooper, Stamatakis, Foster, Crowne & Sabin, 2005), strategies that engage obese children and adolescents in physical activity are warranted. A recent meta-analysis reported that over 135

studies, of varying design, have adopted exercise as a method of treatment for child obesity (Maziekas & LeMura, 2003). However, authors concluded that a large proportion of these studies were limited by their design. A lack of follow-up measurement, poor retention rates and/or a lack of control for confounding variables such as dietary changes or illness were cited as design flaws (Maziekas & LeMura, 2003). These conclusions have been substantiated with authors indicating that few treatment randomised control trials (RCT's) exist that are of high quality, with most employing interventions that are unlikely to be generalisable (Reilly, 2006).

Childhood obesity treatment trials involving exercise have been predominantly aerobic in nature and have tended to focus on modifying body composition variables as their main objective (Epstein et al., 1985b; Epstein et al., 1990; Gutin et al., 1999). A range of modalities have been adopted including rowing, treadmill walking, cycling and physical activity-based games (LeMura & Maziekas, 2002). Exercise treatment programmes have differed markedly in method. Interventions have ranged from three to 30 weeks in length, between 20 and 60 minutes per session and have required participants to attend between one and in some cases seven sessions per week (Maziekas & LeMura, 2003). The diverse nature of previous exercise-based treatment interventions inhibits replication and makes it difficult to determine precisely which aspect of the intervention influenced obesity status or associated study outcomes.

The most favourable alterations in body composition appear to be associated with low-intensity, long duration sessions and longer training periods (Reybrouck, Vinckx, Van den Berghe & Vanderschueren-Lodeweyckx, 1990; Sothorn et al., 1999), which might be explained through increases in self-efficacy and physical self-worth, although this is often omitted as an outcome measure. There is also evidence of success where aerobic training is

combined with high repetition resistance training (Schwingshandl et al., 1999) suggesting that future interventions could offer a range of modalities during treatment to facilitate weight change and furthermore encourage adherence. Information is also lacking as to the precise effects of exercise or physical activity on the psychopathology of obese children who participate in treatment programmes. Furthermore, there are few controlled trials that solely use exercise as a treatment method (Summerbell et al., 2003). Instead, studies have tended to combine exercise with other modes such as diet and behavioural therapies, making it difficult to assess the precise impact of exercise as a treatment for the physical and psychopathological consequences of obesity.

2.23. Exercise as a stand-alone treatment

Of the studies (N=5) that have investigated exercise as a sole treatment for childhood obesity, four took place in the United States of America (USA) and were conducted by the same research group. The other study was conducted in Austria (Schwingshandl et al., 1999) making generalisations across different ethnic and cultural populations difficult. Furthermore, the participants in these studies were predominately White and from middle to upper socio-economic groups. Given that there is a strong association between ethnicity, socio-economic factors, and obesity with lower socio-economic groups being most affected (Zhang & Wang, 2004), research with obese children from a diverse socio-economic and ethnically diverse background is required. Although somewhat dated, the research from the Epstein research group has indicated that lifestyle exercise interventions might be more beneficial for weight loss compared with aerobic exercise. Epstein and colleagues offered no comment on reasons why this might be the case, but it seems likely that lifestyle exercise could offer less in the way of participation barriers than aerobic exercise or sport, namely facilities and equipment. This is particularly important given that opportunities to exercise in areas of socio-economic deprivation might also be limited (BMA, 2005).

The limited evidence available indicates that exercise has some benefit and reduces the risks of metabolic and cardiovascular complications in obese children, even in the absence of dietary intervention (Ferguson, Gutin, Owens, Barbeau, Tracy & Litaker, 1999). However few (N=3) studies have examined the effects of exercise on the psychopathology of obese children, which has been demonstrated to be a worrying health consequence associated with obesity in this population. Given the impact of obesity on psychopathologic outcomes in obese youngsters (Morgan et al., 2002; Zimetkin, et al., 2004) and the potential of exercise to ameliorate psychopathology (Biddle, Cavill & Sallis, 1998) further quality-controlled investigations involving exercise would make a useful contribution to the field.

2.24. Long-term success of treatment interventions

Frequently, studies (see Table 1; Epstein, et al., 1984; 1985a; 1985b; 1995; Hills & Parker 1988; Rocchini, 1988) including camp-based programmes (Gately et al., 2000; 2005), have demonstrated some success in reducing body weight after the initial intervention period (Epstein et al., 1985), but participant weight loss is not maintained at follow-up in most studies. Perhaps one of the biggest stumbling blocks in achieving long-term success with the child obese population is the duration of physical activity that is often expected of them. Gutin and colleagues (1999) commented that previous exercise interventions have often required obese children to be exposed to a substantial dose of physical training. This could be a daunting task for reportedly sedentary children (Cooper, Andersen, Wedderkopp, Page & Froberg, 2005), and is therefore unlikely to be enjoyable. There is also evidence that children who are obese choose not to take part in physical activity because of low actual and/or perceived physical competence (Okely, Booth & Patterson, 2001). Early positive physical activity experiences might predispose individuals to enjoy physical activity in later years and could therefore be seen as central to an individual's future behaviour. For the obese child, who typically has limited aerobic and anaerobic capabilities (Reilly, 2006) as well as low

body esteem and self-concept, low intensity, intermittent exercise could be sustainable and facilitate a longer-term adherence to exercise (Gately et al., 2000).

2.25. Exercise interventions and psychopathology of obesity

Physical activity can contribute to the enhancement of psychological and social well-being (Biddle et al., 1998). Exercise enhances mood, self-concept, self-esteem (Biddle & Mutrie, 2001; Brandon & Loftin, 1991) and quality of life (QoL) (Paffenbarger, Lee & Leung, 1994; Stephens, 1998). However, the impact of physical exercise on the psychopathologic conditions reported in obese children has largely been ignored in randomised controlled research (Summerbell et al., 2003). There is however preliminary evidence from non-randomised physical activity trials (Stella, Vilar, Lacroix, Fisberg, Santos & Mello, 2005) and camp-based studies (Barton et al., 2004; Gately et al., 2000 & 2005; Walker, et al., 2003) that indicate participation in exercise programmes can influence dimensions of psychological health in obese children. Given the high prevalence of psychopathology (Mellin et al., 2002) and lack of data regarding the impact of treatment interventions on obese children's psychosocial health, a detailed critique of these non-randomised, pre to post studies, is warranted here.

Stella and colleagues (2005) investigated the role of different physical activity programmes to reduce anxiety and depression inventory scores in obese adolescent girls. The sample consisted of 40 female (mean age 16 years) adolescents with a BMI above 95% percentile who had volunteered for the study. Details of socio-economic status and ethnicity of participants are not reported, although it is assumed that all participants were Brazilian due to the location of the study. Symptoms of depression and trait-state anxiety were recorded before and after the 12-week intervention. Participants were selected to attend one of four conditions: aerobic training, anaerobic training, leisure activities or control. The method of allocation to groups was not stated. Participants allocated aerobic activity or anaerobic interval training,

exercised on a cycle ergometer for 40-minute, 50-minute and 60-minute sessions during the first, second and third months respectively. Exercise intensity during these sessions was based on anaerobic ventilatory threshold data. Leisure physical activities included games and exercises, with participants attending weekly sessions lasting 60-min at a sports centre. The aim of the leisure activity was to encourage participants to practice a new habit of physical activity not characterised as specific training. The control group were interviewed by a nutritionist every week, but did not take part in leisure or training activities.

In terms of psychopathology, only the aerobic exercise group showed significant reductions in depressive symptoms. However, the scale employed (Beck Depression Inventory, 1961) was principally designed for use with adults. Instead a child specific scale such as the Children's Depression Inventory (CDI: Kovacs, 1992), which has received support as a screening tool for depressive disorders in children and adolescents (Timbremont, Braet, & Dreessen, 2004), might have been more appropriate. Stella et al., (2005) found no difference between intervention groups for exercise trait-state indices, whereas the control group reported significant reductions in trait anxiety. The authors suggest that the reduction in trait anxiety could be explained by the professional attention received for the nutrition element of the study. Stella and colleagues go on to argue that attention in itself might reduce social isolation and improve emotional states among overweight young people. Therefore it might be important for future studies to control for the affect of attention. Moreover, it is unclear from the method whether all groups received professional assistance and attention from a nutritionist weakening the ability to generalise the findings. The positive effects of aerobic exercise on depression reported in the study are consistent with previous research supporting the anti-depressive effect of exercise (Nabkasorn et al., 2006). However, the aerobic training method Stella et al., (2005) adopted was lengthy and uni-mode. It is unlikely that for obese children, who tend both to be sedentary and have had poor experiences with exercise, this

type of intervention would be enjoyable or sustainable. Instead, obese children and adolescents might be more amenable to smaller increases in physical activity (Reilly, 2006). Stella and colleagues (2005) did not report attendance, adherence or aerobic output data during sessions or information concerning the nutritional arm of the study, making it difficult to determine the usefulness of the intervention. Information that describes participant engagement is particularly important given that one of the challenges in the treatment and consequences of obesity is poor compliance. Future studies might wish to address these shortfalls and in particular include a qualitative element to gain insight into the exercise experiences of obese children, for researchers and practitioners to be better placed to design successful interventions.

2.26. Evidence of psychopathology treatment from US and UK residential weight-loss camps

Adopting a pre to post method, Gately and colleagues (2000) investigated the effects of an eight-week diet, exercise and educational residential weight-loss camp on body composition, aerobic performance and psychometric variables in obese children. In total 194 children (64 boys and 130 girls, mean age 12.6 years) from high socio-economic status families enrolled at a USA summer weight-loss camp. Follow-up was completed on the 102 children (38 boys and 64 girls, mean age 13.6 years) who returned one year later. The camp programme (Massachusetts, USA) utilised structured fun-based skill learning physical activities, moderate dietary restriction and behaviour modification and aimed to reduce body mass and promote the maintenance of the reduction in body mass using an alternative to standard exercise prescription. The 8-week intervention produced significant reductions in mean body mass, BMI and waist circumference post intervention. Significant improvements in body esteem, body cathexis and self-concept were reported but these data were limited to a sub-group (N=40) of girls. No evidence for the psychological impact of the camp on the male camp participants was available, limiting the generalisability of the findings. Furthermore, appropriate measures of physical self-competence such as the Physical Self-Perception Profile

(Fox & Corbin, 1984) might have been useful here given the skill-based physical activity method adopted as the camp intervention. Improvements in psychometric variables were greater during the second four-weeks of the eight-week camp programme. This could be explained by an increase in task-specific self-efficacy (although this was not measured) but might also be explained by the probable attention effects of a residential camp-based design, however there was no effort to control for this in the study. Although these findings suggest that the use of a structured fun-based skill learning programme might be successful in changing body composition and psychosocial outcomes in adolescents who are obese, these findings though should be interpreted in light of several limitations: First, the non-randomised method and failure to control for attention factors certainly reduces the ability to generalise from the study; second, the population sample was drawn from high socioeconomic status families from the USA and might have limited applicability to obese children in the UK; and third, analysis of the impact of the camp on psychosocial factors was limited to a selected group of 40 girls and there was no mention of baseline psychopathology variables for the camp population as a whole, weakening any generalisations that are made. While this study provides data on the potential association between exercise participation and psychopathology related outcomes, further research is required to determine the wider impact of camp-based programmes and in particular their effect on psychopathology outcomes in obese adolescents using RCT methodologies.

Several studies (Barton et al., 2004; Gately et al, 2005; Walker et al., 2003) use data collected from a rolling residential weight-loss camp-based in the UK. A brief overview of the camp is provided below with results and an appropriate critique presented for each study. The UK-based residential weight-loss camp held at Leeds Metropolitan University offers camp attendees a programme of physical activity, diet and education over six-weeks. Campers participate in six one-hour fun-based, skill enhancing physical activity sessions per day.

Campers also attend weekly nutrition, lifestyle and discussion sessions. All sessions included instruction and discussion of self-monitoring, goal setting, problem solving, cognitive restructuring, stimulus control and ways to support structures post-camp. Daily energy expenditure is controlled. Campers are divided into single sex groups. Parents are encouraged to attend seminars and spend time at the camp and were provided with an information booklet at the beginning of the camp (Gately & Cooke, 2003).

The first report (Walker et al., 2003) to focus on the effects of residential camps on psychopathology in obese adolescents concentrated on change in body image (Phillips & Hill, 1998), self-esteem (Fox & Corbin, 1984), and worries in attending a residential weight-loss camp (Wadden, Brown & Foster, 1991). Data from camp attendees were compared with a non-intervention control group of lean adolescents. Findings indicated that obese adolescents lost 5.6 kg, reduced their BMI by 2.1 kg/m², and BMI standard deviation score (SDS) by 0.28, while comparison children gained weight. Body shape dissatisfaction decreased significantly and self-esteem increased significantly on measures of global self-worth, athletic competence, and physical appearance, in the camp attendees. This improvement took place without any exacerbation of existing worries about appearance or weight. While obese adolescents had lower self-worth and greater body dissatisfaction compared with the comparison children at the start of the camp, the intervention improved their psychological state. However, weight loss was positively associated with psychological improvement, which has been shown to be fragile in adult populations (Tinker & Tucker, 1997) and requires further investigation with obese adolescents. There are some study-specific limitations that are worthy of brief comment here. The attention effects of camp-based interventions remain a methodological issue as they were not controlled in this study. It is also not clear which aspects of the camp-based programme were responsible for the psychological improvement. Furthermore, the camp did not include a specific and structured psychological intervention, which further supports the

notion that attention alone might be sufficient to elicit psychological change in obese individuals with low levels of self-esteem (Friedlander et al., 2003). This suggestion receives support from Holt and colleagues (2005) who investigated the perceptions of children who attended this weight-loss camp. Support from peers and staff was cited as being important aspects of the camp suggesting that camp attendees valued the attention they received. Finally, the longevity of the change in psychological variables is unknown and future studies that include longer follow-up periods are needed.

The second report (Barton et al., 2004) from the Leeds residential camp concerning psychopathology outcomes investigated how obese adolescents think about themselves in terms of exercise, eating, and appearance and whether these cognitions change over the course of the residential weight loss camp. Assessments of body mass, stature, self-esteem and a sentence-completion test eliciting thoughts and beliefs about exercise, eating, and appearance were completed before and after camp and were compared with a single assessment of 20 normal-weight adolescents. Results showed that the obese adolescents lost 5.7 kg and reduced their BMI SDS by 0.25. Camp residence was associated with a significant reduction in negative automatic thoughts and a significant increase in positive exercise and appearance thoughts. Obese adolescents not only lost weight, but they improved their self-representation, specifically their automatic thoughts about exercise and appearance. Including BMI SDS change as a covariate took away all main interaction effects of time, showing that cognitive change was largely accounted for by the reduction in weight highlighting once more the potential danger of focusing on weight-loss during intervention programmes (Tinker & Tucker, 1997).

Most recently, Gately et al., (2005) evaluated the outcomes of the first four years of their UK weight-loss camp, through anthropometry, physical state, self-esteem, and sports skills. A

total of 185 overweight children (mean age: 13.9 years) enrolled in one of four consecutive programmes between 1999 and 2002 (intervention group) were compared with 94 children of similar age who were not camp attendees (38 overweight children and 56 normal-weight children). Campers, who stayed for a mean of 29 days, lost 6.0 kg, reduced their BMI by 2.4 units, and reduced their BMI SDS by 0.28. Camp attendees also showed significant improvements in blood pressure and aerobic fitness. Most relevant to this review was the baseline difference found in measures of self-esteem, with the campers scoring lower than the normal-weight comparison children but not the overweight comparison children. This further confirms the incidence of psychopathology of obese children presenting for treatment previously reported (Zeller et al., 2004). At follow-up campers improved their self-esteem, whereas the other groups did not. There was no comment on other psychopathological variables. Longer durations of stay were associated with greater improvements in outcomes, highlighting the potential impact of attention effects. The results from the study suggest that weight-loss camps adopting a similar method to that proposed by Gately and colleagues might be an effective intervention across a range of health outcomes, although the non-randomised design limits the strength of the conclusions drawn from this study. The authors indicated that it was not possible to identify the most effective parts of the intervention and whilst increasing physical activity, reducing sedentary behaviours and intakes of high-fat, energy-dense foods were cornerstones of the camp programme, their success in achieving and maintaining a negative energy balance could be highly dependent on non-specific factors, such as the social environment of the camp and its residential nature. Accordingly, future studies should control for such factors.

In summary, whilst residential weight-loss camps have the potential to positively influence weight status (Gately et al., 2005) and increase positive exercise and appearance thoughts (Barton et al., 2004), they have several limitations. Small sample sizes in comparison groups

and a lack of random allocation of participants to the groups in camp-based studies make it difficult to draw conclusions. The long-term impact of camp-based interventions on weight status and psychosocial measures were not assessed. Providing a controlled, safe, enjoyable, and social environment is likely to be a major contributor to positive changes in psychopathology found in the Leeds camp-based studies. However, it is of concern that the social dependence created during the camp referred to by Gately and colleagues (2005) might not be replicable during free-living, resulting in long-term negative health and social consequences for obese individuals presenting with low self-esteem. Therefore, future studies should seek to address such concerns. Weight-loss camps as with other psychological treatments; (cognitive behavioural therapy, psychotherapy and/or counselling) can be expensive, hence prohibitive. Consequently, there is much to commend other strategies (Fox, 2004). Martinsen (1993) has made a strong case for the use of exercise as therapy by suggesting that exercise can be a low cost, self-sustaining activity once the basic skills have been learnt. This is an important consideration when planning interventions in that exercise could provide improvements in the overall functional ability of obese individuals and this might be effective in changing body perceptions. Related to this, the positive relationship between exercise and mental health could be explained through the physical signs associated with exercise (muscle tone and weight loss) and these signs can be viewed as positive cues towards a sense of achievement in one's physical self. Often obese adolescents have negative feelings about their bodies and might assume that there is very little that they can do to change their body composition. While other types of psychological therapy (counselling) can be useful in changing obese adolescents' mental states, exercise has the potential to influence their physical and psychological health simultaneously, making it a cost-effective approach to managing obesity. Therefore, interventions that address both physical and psychological concerns associated with obesity in children are clearly warranted.

2.3. DIETARY INTERVENTIONS

Although it is essential that every child should have a well-balanced diet and so obtain all the nutrients required for physical and mental growth and development (BMA, 2005), there is little evidence that changes in diet can positively impact on psychopathology of obese children. Results from a school-based RCT (Sahota, Rudolf, Dixey, Hill, Barth & Cade, 2001) found that even in the presence of clinically important increases in vegetable intake, global self-worth remained unchanged post-intervention. Nevertheless, despite dietary factors being cited as a major cause for the obesity epidemic (Swinburn & Egger, 2002) and given dietary components are regularly incorporated into treatment interventions, the effectiveness of such interventions is worthy of brief comment.

A healthy and well-balanced diet with regular meals is central to maintaining a healthy body mass and yet previous literature indicates that many children and adolescents, including those who are overweight (Pastore, 1996), skip meals and eat more food later in the day (Dwyer et al., 2001). Overweight children have also been reported to eat smaller breakfasts and larger lunch compared with non-overweight children. This is important, as it has been suggested that eating breakfast reduces fat intake and limits snacking over the remainder of the day (Dwyer et al., 2001). Encouraging obese children to adopt regular eating habits as part of a lifestyle or behavioural change intervention programme is therefore recommended.

Evidence that supports nutrition education alone as an intervention to treat childhood overweight is limited (Summerbell et al., 2003). Most studies have used techniques such as portion control and higher-density food restriction, with the traffic-light diet (Epstein, 2003) receiving most investigation. Individualised dietary programmes have shown little success (Becque, Katch, Rocchini, Marks & Moorehead, 1988) and most cannot be sustained under free-living conditions (Hirsch, Hudgins, Leibel & Rosenbaum, 1998). Some years ago Epstein

(1984) examined the effect of diet-plus-lifestyle-exercise versus diet-only and waiting-list control over six months. Both treatment groups made significant reductions in weight status and adiposity, compared with the control group. No comment was made on the psychological benefits of this reported change in weight. However, at six months and 12 months follow-up, change in weight status between the groups was not maintained. In adults, failure to maintain weight status has been shown to impact negatively on mental well being, particular self-esteem and self-confidence of the studies participants (Tinker & Tucker, 1997).

Several studies (DeWolfe et al., 1984; Epstein et al., 1995; Flodmark et al., 1993; Gately et al., 2000; Golan et al., 1998a; Graves et al., 1988) have examined dietary counselling in conjunction with behaviour modification and/or counselling and/or physical activity/exercise, resulting both in short and long-term reductions in weight status and adiposity. Although studies have indicated success for weight loss, to date there is no evidence that changes in diet elicit improvement in mental health in children who are obese. Encouraging weight loss via dietary restriction without first learning appropriate cognitive and behavioural adherence and/or maintenance strategies, could create a cycle of weight loss - weight regain, leading to low self-confidence as reported in the adult population (Tinker & Tucker, 1997). It is perhaps more conducive to positive mental health to comment on diet during an intervention programme rather than focus specifically on this issue. It could be further argued that treatment interventions should instead concentrate on equipping individuals with the confidence and efficacy to change negative behaviours and adopt positive new ones, such as stressing the need to eat at regular intervals and avoid snacking (Dwyer et al., 2001). Moreover, other aspects of the treatment programme such as increasing self-efficacy to encourage behaviour change appear, equally, if not more important.

2.4. BEHAVIOURAL THERAPY

Genetic factors are not the primary cause of obesity (BMA, 2005). Instead, the creation of an 'obesogenic' environment (Swinburn & Egger, 2002), combined with a reduction in habitual physical activity (DoH, 2004) has led to the rise in obesity particularly amongst youth. It has been established that dietary and exercise interventions as stand alone treatments for obesity have had limited success (Summerbell et al., 2003) with dietary interventions having the potential to create cyclical weight loss and re-gain, leading to reductions in self-confidence (Tinker & Tucker, 1997) in a population already struggling with esteem issues (Mellin et al., 2002; Puhl & Brownell, 2003; Zimetkin et al., 2004).

There is some limited evidence that obesity is a learned disease, and that it could be possible to reduce the prevalence by relearning (Flodmark, Lissau, Moreno, Pietrobelli & Widhalm, 2004). However, evidence for this notion has been difficult to obtain. A method that binds together aspects of education, counselling and exercise to offer a holistic approach seems worthwhile. In support of this view, evidence from studies (Mellin et al., 1987) that encouraged adolescents to make successive, sustainable, small modifications in attitudes towards diet, exercise and lifestyle is optimistic, with reference to self-esteem in particular. The "Shapedown" programme (Mellin et al., 1987) offered a multi-disciplinary approach to obesity treatment. Participants in the "Shapedown" (Mellin et al., 1987) intervention group (N=37) showed significant improvement in body mass, weight-related behaviour, depression and knowledge of weight management concepts at one-year follow-up compared with a no-treatment control group (N=29). The "Shapedown" (Mellin et al., 1987) study introduced the notion that the physical and mental states associated with obesity are not easily separated and indicated that increases in self-esteem could predispose changes in weight.

Social cognitive theory (Bandura, 1977) supports the intervention design in encouraging participants to make small but sustainable modifications to behaviour, therefore increasing self-efficacy; that is an individuals' belief that they can successfully perform a behaviour (Bandura, 1986). Increases in self-efficacy might lead to long-term adoption of new healthy behaviour patterns. It could be argued that the increase in self-esteem noted in the Shapedown intervention group could have led to increased perceived physical competence, although this was not directly measured. Competence motivation theory (Harter, 1978) suggests that positive changes in perceived physical competence are important because children's motivation to participate in physical activity can be influenced by their actual perceived competence. Changing an individual's perception of their ability to perform a task (task specific self-efficacy) as posited by Bandura, (1986), may also successfully affect behavioural outcomes. On this basis, the goal of future interventions should be to promote perceived physical competence and task specific self-efficacy to elicit and maintain changes in actual behaviour. In addition, early positive physical activity experiences have been shown to influence individuals' enjoyment of physical activity in later years (Booth, 2001; Corbin, Pangrazi & Reston, 1998) therefore providing a platform of positive exercise experience would seem beneficial.

2.5. ADHERENCE TO TREATMENT PROTOCOLS

A consistent critique of previous treatment intervention studies focusing on childhood obesity is the poor adherence to treatment protocols (Epstein, Myers, Raynor & Saelens 1998), and lack of pre and post-measures (LeMura & Maziakas, 2002). Most behavioural-based studies involve prolonged intervention periods, (Brownell et al., 1983; Epstein et al., 2000; Flodmark et al., 1993) with some interventions being as long as six months (Epstein et al., 1989). Adopting a lengthy programme of change that includes an exercise component might be overly daunting for obese children who are typically sedentary, with low self-esteem and impaired physical functioning (Friedlander et al., 2003). Where behaviour therapy

interventions are designed to facilitate the adoption of new behaviours, the duration of such interventions could be pivotal to their success. Senediak and Spence (1985) assessed the effects of rapid (eight sessions in four weeks) or gradual (eight sessions over 15 weeks) behavioural treatment versus a non-specific control condition and a wait-list control group. Results (26-week follow-up) indicated a change in terms of weight for those in the gradual behavioural group compared to the rapid group. However, this evidence is over 20 years old and more up-to-date evidence is now required to confirm whether the length of intervention is important. Maziekas and Lemura (2003) reported that in terms of changes in body composition the longer the intervention, the more positive the results. However, it could be argued that this might create too much dependence, thereby creating a culture where obese individuals become serial intervention attendees. It appears important that interventions are designed in such a way that they equip individuals with the necessary skills and efficacy to maintain changes to behaviour long after the intervention period.

Studies have suggested that behavioural counselling as part of interventions can produce successful results in terms of weight loss (Epstein et al., 2000; Mellin et al., 1987). There is also evidence that cardiovascular fitness can improve without concurrent reductions in weight. This could be important for health in terms of cardiac risk and implies that it might be more beneficial to be fitter and not necessarily thinner (Nassis, Psarra & Sidossis, 2005). Ultimately, the addition of the behavioural techniques such as; contingency contracting, self-monitoring, praise, and stimulus control, to nutrition education and exercise appears to be successful, but only in the short-term (Summerbell et al., 2003). Moreover, it is unknown if these results impact an individual's physical self-efficacy and physical self-esteem, and positively affect the psychopathology associated with obesity.

2.6. POTENTIAL ISSUES WITH TREATMENT INTERVENTIONS

Child obesity treatment/prevention programmes and untested health education messages have the potential to stigmatise participants (Latner & Stunkard, 2003), and perpetuate the beliefs that overweight/obese people are ‘weak-willed, ugly and awkward’ and ‘gluttonous, lazy, bad, weak, stupid, worthless and lacking in self control’ (Hill & Silver, 1995; Wardle & Cooke, 2005). Highlighting the problem of being overweight in prevention programmes aimed at young people is likely to have adverse effects. Potentially making children more sensitive about their weight and self-perceived lack of athletic ability (O’Dea, 2006), which could mean they are less likely to participate in physical activity (Shaw & Kemeny, 1989). Studies of barriers to physical activity among adolescents (O’Dea, 2006; Shaw & Kemeny, 1989) clearly identify body consciousness, lack of privacy in changing rooms and physically revealing sports uniforms as major barriers, particularly among girls. Coercing unwilling, body conscious, overweight children into sport or physical activity is likely to exacerbate these problems and further reduce their participation in physical activity. Conversely, involving children in physical activities that they enjoy is likely to boost their feelings about themselves, social interactions and friendships (Strauss & Pollack, 2000), which promote the evidence-based philosophy that fat children can be fit and healthy (Blair, 2003).

2.7. POTENTIAL THEORETICAL UNDERPINNINGS OF TREATMENT

Evidence suggests previous therapy interventions (Epstein et al 2000; Flodmark et. al, 1993; Israel et. al, 1994; Mellin et. al, 1987; Sothorn, Schumacher, von Almen, Carlisle & Udall, 2002) in obese children are based on established paradigms such as social cognitive theory (Bandura, 1986). Techniques commonly employed in these treatment programmes are; self-monitoring of diet and physical activity (Epstein et al., 1990), problem solving (Epstein et al., 2000), stimulus control (Flodmark et al., 1993), cognitive restructuring (Graves et al., 1988), goal setting (Israel et al., 1994), modelling (Deforche, De Bourdeaudhuij, Tanghe, Hills & Debode, 2004) and mastery (Epstein, McKenzie, Valoski, Klein & Wing, 1994). However,

studies often fail to provide a complete description of methods making comprehension and replication of their intervention difficult.

In the adult population, a variety of paradigms, including the theory of planned behaviour (TPB) (Ajzen, 2002) and social cognitive theory (SCT) (Bandura, 1986), have been used to investigate physical activity behaviour. Whilst there is some evidence of these theories being applied to predict children's participation in physical activity (Strauss, Rodzilsky, Burack & Colin, 2001) to date, very little research has concentrated on obese children or adolescents. According to TPB, intention is considered to be the strongest predictor of behaviour, with intentions mediated by attitudes, social influences and self-efficacy. To develop interventions aimed at increasing physical activity levels in obese children, a theoretical approach or strategy that addresses attitudes, social influences and self-efficacy appears warranted. In addition, due to the lack of methodological detail reported for previous studies an intervention that follows a structured repeatable programme is necessary. One such model is the transtheoretical model (TTM) (Prochaska & DiClemente, 1983).

2.71. The transtheoretical model of behaviour change

The TTM (Prochaska & DiClemente, 1983; Prochaska, DiClemente & Norcross, 1992; Prochaska & Velicer, 1997) describes how people modify problem behaviours or acquire positive new ones. The TTM determines behaviour change as a process rather than a single event and offers practical suggestions for how individuals can change behaviour (Prochaska & DiClemente, 1983). Although the TTM was originally designed to aid the cessation of negative behaviours such as smoking (Prochaska & DiClemente, 1983), there is support for the use of the TTM as a tool to increase exercise adoption and adherence in adults (Marcus et al., 1992; Marshall & Biddle, 2001; Nigg & Courneya, 1998; Prochaska & Marcus, 1994; Woods, Mutrie, & Scott, 2002). However, research is required with adolescents. The TTM consists of five constructs: stages of change, processes of change, decisional balance,

temptation and self-efficacy (Prochaska & DiClemente, 1983). Each construct is discussed briefly in section 2.72 to 2.75.

2.72. Stages of change

The stages of change construct of the TTM have received the most research attention (Reed et al., 1997). The stages of change (SOC) represent ordered categories along a continuum of motivational readiness to change (Prochaska & Velicer, 1997). The TTM interprets change as a process involving progress through a series of five stages; pre-contemplation, contemplation, preparation, action and maintenance (Prochaska & Velicer, 1997).

Precontemplation: During this stage individuals are not intending to take action to change behaviour patterns in the foreseeable future, usually measured as the next six months.

Contemplation: Individuals are intending to change in the next six months. They become more aware of the positive side of changing but are also very aware of the negative aspects.

The balance between the costs and benefits of changing can be a very difficult phase to resolve often-producing apathy for the task. *Preparation:* the individual is intending to take

action in the immediate future, usually measured as the next month. They have typically taken some significant action in the past year. *Action:* Individual has made specific overt

modifications in their lifestyles within the past six months. Since action is observable, behaviour change often has been equated with action. However, in TTM action is only one of five stages. Not all modifications of behaviour count as action in this model. *Maintenance:*

Involves the individual working to prevent any form of relapse and increasingly they grow more confident that they can continue their change. Transitions between the stages of change are effected by a set of independent variables known as the processes of change (Prochaska & DiClemente, 1983).

2.73. Processes of change

The processes of change could provide important guides for intervention programmes as they offer a structured method, which might facilitate behaviour change and help individuals move towards the action and maintenance stage of the TTM. The first five processes are classified as experiential processes (Prochaska & DiClemente, 1983) and include: consciousness raising, dramatic relief, environmental re-evaluation, social liberation and self re-evaluation. These processes are adopted primarily in the early stage transitions. The last five processes are labelled behavioural processes and are used primarily for later stage transitions. These include; stimulus control, helping relationships, counter conditioning, reinforcement management and self-liberation. The processes of change are summarised in Table 2.2. To determine the changes in an individual's behaviour, the TTM includes measures that are sensitive to progress through all stages (Velicer, Rossi, Prochaska & DiClemente, 1996). These constructs include decisional balance (advantages and disadvantages of behaviour change) and self-efficacy.

2.74. Decisional balance: advantages and disadvantages of change

Decisional Balance can be seen as a useful predictor in the movement between stages within the TTM (Velicer, DiClemente, Prochaska & Brandenburg, 1985). An individual's evaluation of the benefits and costs of a particular behaviour has been identified as a critical component in the modification of problem behaviours and is particularly useful for evaluating an individual's progress in moving from pre-contemplation to contemplation (Rossi et al., 2001). Decision-making is often conceptualised by a decisional grid, table or balance sheet. The balance between the pros and cons has been shown to vary depending on the stage of change. Prochaska et al., (1994) demonstrated that for 12 different problem behaviours, including weight control, relating the advantages and disadvantages of decision making to the SOC resulted in highly predictable patterns.

Table 2.2. Processes of change (Prochaska & DiClemente, 1983).

Process	Definition	
Consciousness Raising	Efforts by the individual to seek new information and to gain understanding and feed-back about the problem behaviour.	Experiential
Dramatic Relief	Experiencing and expressing feelings about the problem behaviour.	
Environmental Re-evaluation	Consideration and assessment of how the problem behaviour affects the physical and social environment.	
Social Liberation	Awareness, availability, and acceptance by the individual of alternative, problem-free lifestyles.	
Self-Re-evaluation	Emotional and cognitive reappraisal of values by the individual with respect to the problem behaviour.	
Stimulus Control	Control of situations and other causes, which trigger the problem behaviour.	Behavioural
Helping Relationships	Trusting, accepting, and utilizing the support of caring others during attempts to change the problem behaviour.	
Counter-conditioning	Substitution of alternatives for the problem behaviour.	
Reinforcement Management	Rewarding one-self or being rewarded by others for making changes.	
Self-Liberation	Choice and commitment to change the problem behaviour, including belief in the ability to change.	

Results also showed that without exception, the cons of changing the behaviour outweighed the pros for participants who were in the pre-contemplation stage. The opposite was true for participants in the action stage in 11 of the 12 behaviours, suggesting that to move successfully from pre-contemplation to contemplation, requires an individual to increase the number of pros for changing a particular behaviour. This idea supports the notion of designing interventions that increase the pros of changing such as creating a positive experience of behaviour. One way in which this might be achieved is through increasing an individual's self-efficacy, in particular task specific self-efficacy.

2.75. Self-efficacy

Self-efficacy is the situation-specific confidence to overcome a high-risk circumstance without relapse into an unhealthy habit (Bandura, 1992). These efficacy expectations can be thought of as both outcome and personal expectations (Bandura, 1977). The outcome efficacy expectations consist of the belief that certain behaviours will lead to certain outcomes ('if I exercise more I'll lose weight'). The personal efficacy expectations consist of the belief that one can successfully perform those behaviours ('I am certain that I am able to exercise more'). Personal qualities, social factors, and past experience, all contribute to determining an individual's self-efficacy (Schunk, 1991). For example, if an obese child has a negative experience of physical education during school, they will be less likely to participate in physical activity during their spare time, as their self-efficacy for the task will be low. Conversely, creating an environment that offers a positive experience of activity could increase an individual's desire to become physically active. Previous studies have showed that self-efficacy is an important determinant of physical activity in children (Reynolds et al., 1990; Sallis et al., 1992). Given that obese children are less confident in their ability to overcome barriers than their non-obese counterparts (Troost, Kerr, Ward & Pate, 2001) strategies to increase levels of self-efficacy amongst the obese adolescent population are warranted. There are a number of ways in which self-efficacy might be enhanced; Bandura,

(1977) identified past mastery experiences, vicarious experiences (modelling) goal setting and positive effective communication (verbal persuasion). It appears important that these sources of impact self-efficacy are incorporated into future intervention programmes for the treatment of childhood obesity.

2.8. PARENTAL INVOLVEMENT IN THE TREATMENT OF CHILDHOOD OBESITY

Research has indicated a strong link between parental obesity and the likelihood that their children will also be obese (Goran, 2001, Keller & Stevens, 1996). Clinical interventions that have focused on this association have produced some positive results (Coates, Killen, & Slinkard, 1982; Flodmark et al., 1993; Golan, Weizman, Apter & Fainaru, 1998b). A review of family-based interventions suggests children younger than 13 years consistently demonstrated significant reductions in weight status or adiposity, suggesting that the older adolescent population may require a different approach (Berry et al., 2004). This is supported by several behaviour therapy studies (Golan et al., 1998a; Israel, Guile, Baker & Silverman, 1994). In a very early study, Brownell et al., (1983) demonstrated that when mother and child attended sessions separately, greater decreases in weight compared with mother-child together were achieved. These findings were based on a sample of 12-16 year old obese adolescents. However, as only 12 participants (Brownell et al., 1983) were included in the final analysis, the results should be generalised with some caution. Despite the small sample size, the study nevertheless highlighted some notable points concerning the role of the family in intervention studies. Furthermore, Brownell and colleagues (1983) reported that when the mothers were involved in the counselling sessions at the same time as the child, neither child or mother wanted to speak in negative terms, which limited discussion of sensitive issues surrounding weight. This could be explained by early developmental (Erikson, 1950) psychology, which posits that adolescents face the difficult task of seeking independence from parents upon whom they are financially and emotionally dependent. Too much independence might create a disruptive aggressive reaction due to lack of structure, and too much parental support may not

give the child the necessary sense of responsibility. Therefore, it is reasonable to suggest that any positive results in family based approaches might be limited to younger aged children.

2.9. BARRIERS TO PHYSICAL ACTIVITY

Given that the role of physical activity in the maintenance of weight loss is important (Tremblay, Doucet & Imbeault, 1999), motivating obese children and adolescents to adhere to physical activity is essential. Adolescents who develop a habit of participating in physical activity are more likely to remain active as adults (Vanreusel, 1997) and since the transition from adolescence to adulthood marks a striking age-related decline in physical activity (Sallis, 2000); encouraging adherence to exercise/physical activity during adolescence appears critical (Tammelin, Näyhä, Laitinen, Rintamäki & Järvelin, 2003). To facilitate exercise adherence, understanding why obese young people are reluctant to be physically active could be of value. Indeed, the failure of many adult physical activity promotion efforts could be due to the lack of identification of psychosocial determinants of physical activity, resulting in inappropriate programme content and strategies (Reynolds et al., 1990). A recent systematic review (Brunton et al., 2003) reported that barriers to physical activity in children could be attributed to one of three underlying themes: preferences and priorities (a preference for doing other things and a lack of spare time); family life and parental support (parents lack of current participation in, or enthusiasm for, sports and exercise) and restricted access to opportunities for participation in sport or exercise (cost, particularly for children from families with a low income, distance, particular for children from rural areas and lack of facilities). The same systematic review also examined children's views about what might help them to take part in physical activity. Themes included: a choice of sporting and exercise opportunities, physical activity as a means to having fun and spending time with friends, a sense of belonging to a team and enjoyment of competitiveness, (for those children already engaged in sporting activity) and having the opportunity to do things with other family members. Whilst physical activity interventions with obese children might not have the capacity to influence the

children's daily living environment directly, it appears important that the design of such programmes take into account factors such as 'choice of sporting and exercise opportunities' and 'encouraging physical activity as a means to having fun' if they are to promote long-term adherence to physical activity.

2.10. THE PRESENT STUDY

While there continues to be considerable research interest in childhood obesity, there is a paucity of reliable empirical research on how to tackle the problem (Gately et al., 2000). Several intervention methods (dietary restriction, exercise and/or lifestyle counselling, behavioural modification) have been investigated but most appear unsuccessful over time (Summerbell et al., 2003). Current evidence is predominantly drawn from clinically based research in the United States, often with small sample sizes ($n \leq 50$) and involving motivated, predominately white middle class families (Summerbell et al., 2003) making it difficult to generalise the findings across a range of socio-economic populations. Studies have tended to focus on physical health consequences associated with the disease, despite obese children being at high risk for emotional and social problems (Mellin, Neumark-Sztainer, Story, Ireland & Resnick, 2002; Puhl & Brownell, 2003; Zimetkin et al., 2004). To date, little research that has focused on investigating the psychosocial aspects of obesity in children and young people has taken place in the UK (Sweeting, Wright & Minnis, 2005). There is some preliminary evidence from residential 'weight loss' camps (Barton et al., 2004; Gately et al., 2000; Gately et al., 2005; Walker et al., 2003) and other non-randomised research (Stella et al., 2005) that participation in exercise programmes can influence dimensions of obese children's psychological health. However, whilst there is some recognition of the value in assessing the psychosocial impact of treatment interventions with obese children and adolescents, much of the evidence is limited to non-randomised studies (Barton et al., 2004; Gately et al., 2000; Walker et al., 2003). These studies were also limited by small sample sizes and lacked behaviour maintenance strategies (such as home programmes) after

treatment. It was also suggested that the improved psychological health observed in the residential camp population might have been a result of weight loss (Walker et al., 2003) as opposed to changes in physical self-competence, which has been shown to be fragile in other populations (Tinker & Tucker, 1997) and requires further investigation with obese adolescents. Comprehensive measures of psychopathology within such research are lacking and commonly studies have tended to determine the psychosocial impact of treatment solely from a self-esteem inventory (Barton et al., 2004; Gately et al., 2005; Walker et al., 2003) such as the physical self perception profile (Whitehead, 1995). In addition, other obesity associated psychopathology variables such as depression, mood (Mellin, et al., 2002; Zimetkin et al., 2004), and health related quality of life (Schwimmer et al., 2003) have tended to be overlooked. Therefore, studies that include comprehensive robust and valid measures of a range of psychopathology related variables within obesity treatment programmes are necessary.

2.101. Design of treatment interventions

Research is lacking on ways to tailor interventions to the needs and interests of obese (including morbidly obese) young people with the role of physical activity in interventions requiring clarification. Motivating obese children to exercise cannot be achieved in the same way as children of normal weight (McWhorter et al., 2003). Despite the obvious physiological differences from children of normal weight, obese children and adolescents demonstrate emotional differences (Sothorn et al., 1999). The low self-esteem presented typically in obese individuals (Israel & Ivanova, 2002) might be preventing them from engaging in regular physical activity and positively impacting their health. It is therefore important that interventions are designed to address these issues. To make a real difference to the health of obese children, treatment interventions should follow a clear strategy, preferably underpinned by behaviour change paradigms. It is essential that methods can be replicated and that the psychopathology of obesity is not ignored within treatment interventions. As such interventions should be focused on increasing the physical self-worth of obese children and

adolescents to encourage physical activity participation that in turn may lead to physiological (Schwingshandl, et al., 1999) and mental health benefits (Biddle et al., 1998). It appears that any method of obesity treatment should provide more than a short-term approach. If encouraging long-term adherence to physical activity is important then implicit within this approach, is gaining an understanding of how obese adolescents adopt new behaviours. Therefore, studies should provide obese individuals with the physical and psychological tools to sustain new exercise behaviour and experience positive psychological gain from exercise long-term.

2.11. AIMS

At the time of the study, database searches indicated that no published RCT had examined the efficacy of a supervised exercise therapy intervention, specifically to investigate psychopathology outcomes in obese adolescents. Further, no published trial has included an equal contact exercise-placebo arm in an attempt to account for the attention effects that might be associated with lifestyle interventions in obese adolescents. The inclusion of an exercise-placebo group allows for a more stringent test of exercise as a clinically meaningful treatment because it equates social contact between the groups. The exercise experiences of obesity young people presenting for treatment are also often overlooked within the literature. This study aimed to address the shortfalls of previous research.

2.12. PRIMARY HYPOTHESIS

The primary trial hypothesis was that exercise therapy would lead to improvements in participants' physical self-esteem and reductions in psychopathologic conditions, by implication these changes would also translate into increased physical activity and reduced BMI over time.

3.0. METHODS

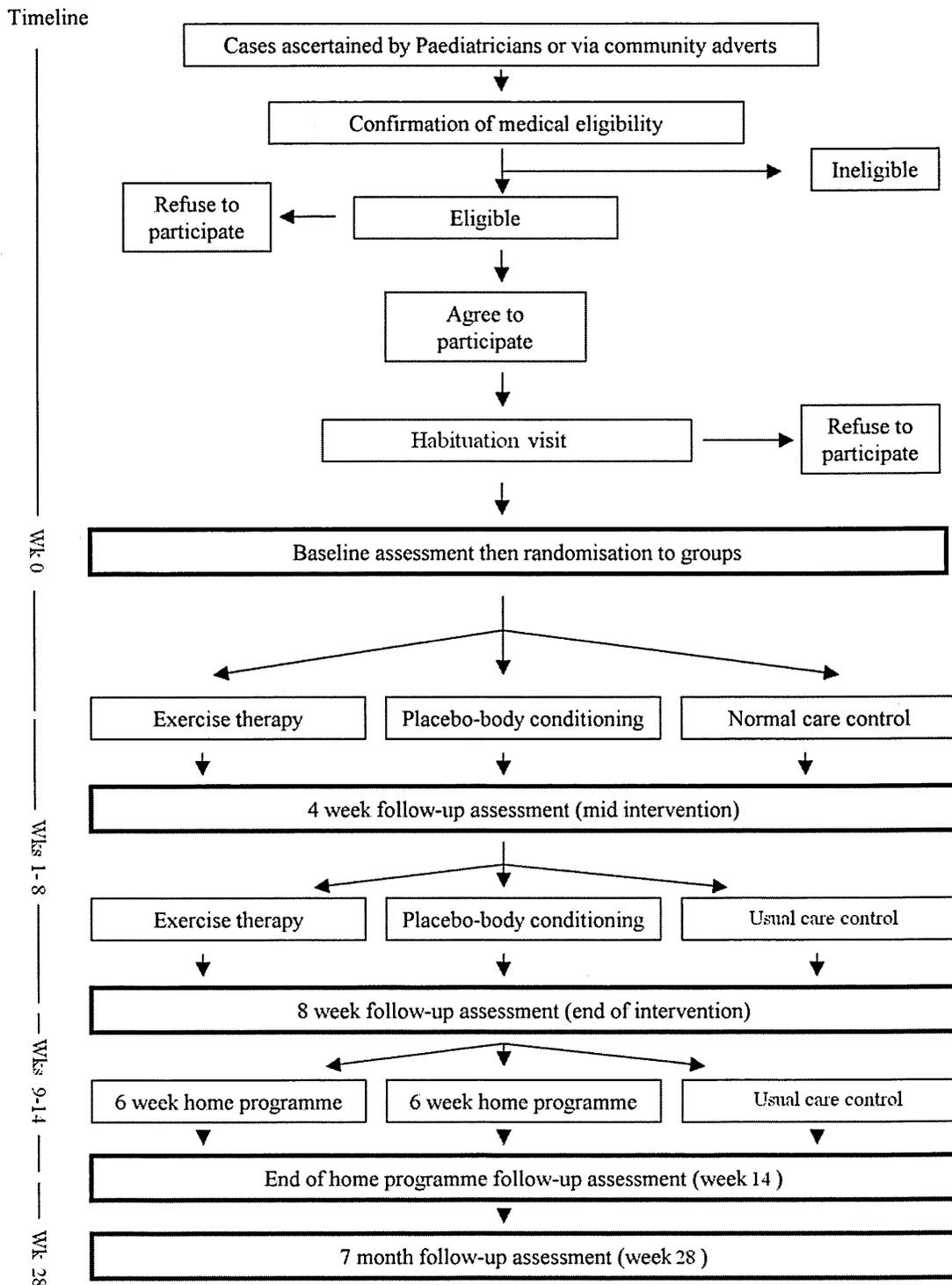
3.1. RESEARCH DESIGN

This study was a randomised controlled trial (RCT) that included an intervention period of eight-weeks, followed by a six-week home programme phase (week 14), with a three month post home programme follow-up (week 28). Figure 3.1 depicts the timeline of the trial.

3.2. PARTICIPANTS AND RECRUITMENT

The study sample consisted of 81 obese (BMI >2.5 SDS, adult equivalent BMI of ≥ 30) and morbidly obese (BMI >3.5 SDS, adult equivalent BMI of ≥ 40) adolescents (36 males, 45 females) aged between 11-16 years. Participants were recruited either by referral from a paediatrician at Sheffield Children's Hospital or via community and media advertisements publicising the study. Referrals were made based on the criteria outlined in section 3.4. Referred children were invited to attend the study via letter (Appendix 1) and were also provided with a participant information sheet at this point (Appendix 2). Upon agreement to enter the study, the parent/guardian was contacted via the researcher and a familiarisation session arranged at the Centre for Sport and Exercise Science, Sheffield Hallam University (study centre). It was made clear to all potential participants and their parents/guardians that by attending this session there was no obligation to take part in the study. Medical clearance for participation was provided through clinicians based at the paediatric endocrinology unit, Sheffield Children's Hospital. Participants recruited to the study via community advertisements or media adverts underwent a medical screening at trial centre, conducted by paediatricians from Sheffield Children's Hospital.

Figure 3.1. Flowchart showing the timeline for the trial



3.3. POWER CALCULATIONS FOR DETERMINATION OF SAMPLE SIZE

Power calculations were based upon physical self-worth as the primary outcome measure: predicted effect size = 0.6; number of groups = 3; number of repeated measures (RM) = 5; correlations between RM = 0.06, alpha = $p < 0.05$). The equation used for power calculations were taken from Park and Schutz, (1999). On the basis of these data, 90 participants, 30 randomised to each group, would yield an 80% power to detect a change in physical self-worth at the alpha level of 0.05.

3.4. RECRUITMENT CRITERIA

Participants were recruited according to the following criteria: 1) adolescents whose body mass index (BMI) exceeded the 98th percentile (+2 SDS) for age and sex according to UK reference data in 1990 (Cole, Freeman & Preece, 1995) were eligible for the study. Due to the constantly changing relationship of body mass to stature, BMI centiles were deemed as the only appropriate means of assessing obesity in a growing child. 2) Children with a medical condition (including major cognitive impairment) that would restrict ability to be active three times per week for eight weeks were not eligible. 3) Children diagnosed with insulin dependent diabetes or receiving steroids were also not eligible. Those children that satisfied these criteria were asked to attend a familiarisation session.

3.5. FAMILIARISATION SESSIONS

During the familiarisation session all participants received a detailed explanation of the trial protocols as approved by the local ethics committee. It was made clear to all potential participants that they had an equal chance of being randomised to one of the three trial groups, including the usual care control group. A parent/guardian was present at all times during this session. At the end of the session written informed consent was taken from the child and the child's parent/guardian by the researcher (Appendix 3).

3.6. RANDOMISATION PROCEDURES

After baseline screening and informed consent procedures, eligible participants were randomly allocated by an independent researcher using a computer generated list to supervised exercise therapy, exercise placebo or the usual care control group.

3.7. ETHICS APPROVAL

Ethics approval was granted from South Sheffield Local Research Ethics Committee provided written informed consent was obtained from all participants and their parents/guardians before they entered the study.

3.8. ATTENDANCE AND INCENTIVES

Participants randomised to the exercise therapy or exercise placebo groups were asked to attend the trial centre three times per week for eight-weeks. A total of 24 sessions were offered to each participant. Each session lasted for one hour and took place on a one-to-one basis with the researcher. During term time sessions were conducted between 3:30pm and 8:30pm. During school holidays sessions operated throughout the day. Weekend sessions were offered to those participants who were unable to attend three sessions during the week. To facilitate programme adherence, all participants received a £25 sports voucher for completing the eight-week exercise intervention. An additional £10 sports voucher was given to participants upon completion of the final follow-up assessment at 28- weeks.

3.9. PSYCHOPATHOLOGY OUTCOMES

3.91. Physical self-perceptions (primary outcome measure)

The Physical Self-perception Profile (PSPP) was originally developed by Fox and Corbin (1989) and later adapted for use with children by Whitehead (1995). The PSPP has been found to be a reliable and valid means of assessing adolescent personal self-perception with studies reporting high reliability coefficients ranging from 0.80 – 0.88 for boys and 0.80 –

0.90 for girls (Whitehead, 1995). The inventory contained six 6-item subscales (1) Sport/Athletic Competence, (2) Attractive Body Adequacy, (3) Condition, (4) Strength, (5) Physical Self-worth and (6) Global Self-worth. The Sport/Athletic Competence and Global Self-worth subscales have been taken from Harter's (1995) Manual for the Self-perception Profile for Children. The Children and Youth Physical Self-perception Profile (CY-PSPP) assesses the degree to which young people view themselves as competent in a variety of physical domains. Each question contains two statements relating to either a positive perception of competence or a negative perception of competence. The respondent is required to choose which statement best describes the way they view themselves and answer either 'sort of true for me' or 'really true for me' for each statement. Questions are structured in an alternative format on a scale between 1 (low score) and 4 high score.

3.92. Depression

Depression was assessed using the Children's Depression Inventory (CDI) (Kovacs, 1992). The CDI is a 27-item self-rated symptom-orientated scale suitable for school-aged youngsters and adolescents. For each item, the child is asked to endorse one of three statements that best describes how he or she has typically felt over the past two weeks e.g. "I am sad once in a while", "I am sad many times" or "I am sad all the time". Each response is scored as 0 (*asymptomatic*), 1 (*somewhat symptomatic*), or 2 (*clinically symptomatic*), contributing to an overall CDI score that can range from 0-54. A range of depression subscales can be calculated from the CDI although only total depression scores were calculated for the purposes of this study. A total CDI score ≥ 13 represents clinically meaningful depressive symptoms (Kovacs, 1992).

3.93. Affect

Specific measures of affect for use with clinical child populations are lacking and as such items used by Ebbeck and Weiss (1998) in sports settings have been included in this study.

Participants responded to two subscales that assessed positive and negative affective responses over the previous week. The positive affect scale consists of five items (proud, satisfied, happy, excited and relaxed); the negative affect subscale consists of four items (angry, guilty, unhappy and nervous). Using a scale between 1 (very slightly) and 5 (extremely) participants were asked to indicate the degree to which each adjective described how they had felt over the previous week.

3.94. Assessment of planned behaviour

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) was developed to predict behaviours in which individuals have incomplete volitional control. Perceived behavioural control indicates that a person's motivation is influenced by how difficult the behaviours are perceived to be, as well as the perception of how successfully the individual can, or cannot, perform the activity. If a person holds strong control beliefs about the existence of factors that will facilitate a particular behaviour, then the individual will have high perceived control over that behaviour. Conversely, the individual will have a low perception of control if they hold strong control beliefs that impede the behaviour. In light of the fact that this intervention study is focused on improving physical self-competence and self-efficacy and given that perception of behavioural control as indicated by TPB (Ajzen, 1991) can reflect past experiences, anticipation of upcoming circumstances, and the attitudes of the influential norms that surround the individual components from the TPB (Ajzen, 1991) were assessed. Questionnaires (Courneya & Bobick, 2000; Courneya & Friedenreich, 1997) assessing subjective norm, perceived behavioural control, attitude¹ and intention of exercise behaviour were administered at all assessment points. Participants were asked to indicate by circling a number between one (strongly agree) and 7 (strongly disagree) to what extent they agreed with statements such as; "I would like to participate in physical activity at least three times per

¹ Due to an administration error, N=56 participants

week", "If I wanted to, I could easily take part in regular physical exercise" or "Most people who are important to me, think I should take part in regular physical exercise".

3.95. Physical activity

Physical activity is a complex heterogeneous entity that presents a challenge in terms of accurate and reliable measurement (Haskell & Kiernan, 2000). Valid measures are needed to understand the relationship between physical activity and health-related variables for children and adolescents (Kowalski, Crocker & Kowalski, 1997). Whilst objective measures of energy expenditure by such techniques as determination of oxygen consumption and accelerometry might offer much in the way of internal validity, they often involve the use of equipment that could interfere with normal activities, and are limited in large studies because of time and expense (Bassett & Strath, 2002). Although questionnaires are prone to various degrees of measurement error depending on the facet of activity queried and the time period considered, they are relatively low cost and offer easy administration (Montoye, Kemper Saris & Washburn, 1996). Furthermore, assumed error in self reports can somewhat be countered with large sample sizes (Wareham & Rennie, 1998). Therefore, despite shortcomings and given the lack of feasible alternatives, the application of self report measures and retrospective questionnaires remain the most commonly used method of physical activity assessment in children (Wareham & Rennie, 1998). Many physical activity self-report instruments have been used with children, however, reliability and validity evidence has often not been provided (Sallis, Buono, Roby, Carlson & Nelson, 1990) limiting the generalisability of some study findings. The Physical Activity Questionnaire for Adolescents (PAC-A) has demonstrated convergent validity compared to several self-report and objective measures of physical activity (Kowalski et al., 1997). With this in mind, the PAC-A was used to collect detailed information about participants' involvement in different physical activities.

Participants were asked about their involvement in (1) various physical activities in their spare time, (2) physical education, (3) lunchtime physical activities, (4) extra-curricular physical

activities, (5) evening physical activities and (6) weekend activities. Each activity was scored on a scale between 1 (not involved) to 5 (involved 5-7 times per week), depending on the participants' degree of involvement in the various activity components. Adding responses from questions one to eight together derived a total score for the questionnaire.

3.10. PHYSIOLOGICAL OUTCOMES

3.101. Assessment of physical fitness using a modified balke test

Aerobic fitness was assessed using a modified Balke treadmill test (Rowland, 1993). The modified Balke protocol required the participants to walk at a pace of 1.34 m s^{-1} at a grade of 6% for 2 minutes. At the end of the two-minute stage, the grade was increased by 2%. This continued until volitional exhaustion. On the occasions that the treadmill reached maximal elevation the participant continued to walk at that gradient until volitional exhaustion. The speed of the treadmill remained constant at 1.34 m s^{-1} for the duration of the protocol. The protocol ended at volitional exhaustion. The test was continuous with no rest periods between each stage. Heart rate (HR) was measured during the last minute of each stage using a short-range radio-telemetry monitor (Polar Research Unit, 1998).

3.102. Justification for use of the modified balke test

The involvement of children and adolescents in experimental research raises clear ethical issues (Armstrong & Welsman, 1997). However, there is sufficient evidence to support paediatric exercise testing, and furthermore the use of maximal protocols (Rowland & Cunningham, 1997). Despite there being no comprehensive data available on procedures for paediatric testing, Rowland (unpublished data), suggested that the treadmill might be the preferred mode. With cycle ergometry, young, obese, or poorly fit individuals might have difficulty sustaining a constant pedal rate or maintaining pedalling for the test duration (Rowland, 1993). In contrast, treadmill protocols engage a larger muscle mass than cycling

with the result that $\dot{V}O_{2 \text{ peak}}^2$ obtained is more likely to be limited by central rather than peripheral factors (Shephard, 1984). With the step bench rarely used to determine $\dot{V}O_{2 \text{ peak}}$, the treadmill offers the most natural characteristics with which to test a population providing that the population can walk and/or run. The first protocols used with children were originally developed for adults (Bruce & Balke protocols). However, despite the advantage of being able to compare data from children with those of adults, the Bruce test involves intensity increments between stages that might be too large and unequal for children. The Balke in its original form is considered to be too long (Rowland, 1993) and involves too high a grade even for fit children (Rowland, 1993). However, a modified walking version of the protocol is well suited to the unfit, obese or chronically ill. A continuous test with exercise stages of one or two minutes that reduces the total duration of the test has been shown to be preferred for the unfit population (Armstrong & Welsman 1997).

3.103. Control measures taken during the modified balke treadmill test

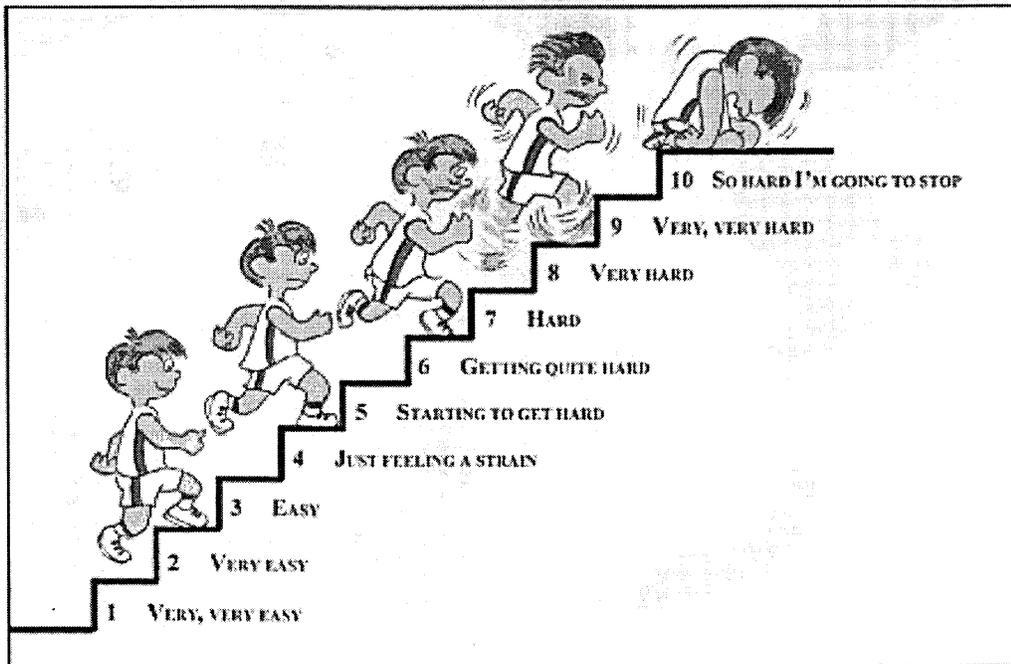
To prevent injury to the participant or researcher, an assessment of risk was undertaken (Appendix 4). All assessments of physical fitness were undertaken using the same treadmill, in the same laboratory. Participants were encouraged by the researcher to continue for as long as possible during the test.

3.104. Assessment of ratings of perceived exertion (RPE)

RPE is discussed in depth in Chapter 7.0. Briefly here, participants were asked to estimate two readings of RPE; 1) aerobic and 2) lower-limb, in the final ten seconds of each two-minute stage using the Pictorial Children's Exercise Rating Table (Yelling, Lamb & Swaine, 2003). The PCERT scale (Figure 3.2), uses pictures as well as descriptive language to assess ratings of perceived exertion (RPE).

² The highest value of oxygen consumption measured during a graded exercise test (McArdle, Katch & Katch, 2001)

Figure 3.2. The PCERT Scale used to assess ratings of perceived exertion



Participants received verbal instruction (read from a standardised pro-forma, further details can be found in Appendix 5) concerning the definition of perceived exertion. These instructions were based on the principles of RPE as outlined by ACSM (2005) and Noble & Roberstson (1996).

3.11. ASSESSMENT FAMILIARISATION

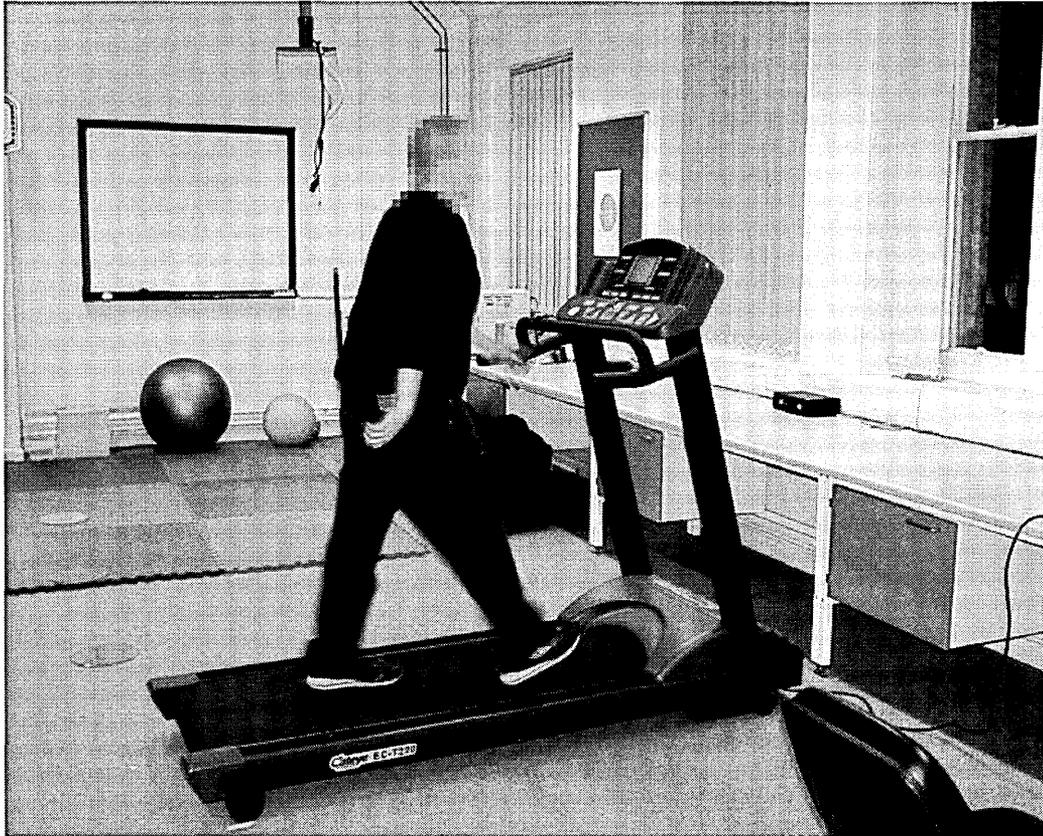
3.111. Questionnaire familiarisation

Questionnaires, compiled into booklet form (Appendix 6) assessed subscales of physical self-worth (PSW) (Whitehead, 1995), depression (Kovacs, 1992), self-perceptions (Harter, 1995), affect (Ebbeck & Weiss, 1998), Theory of Planned Behaviour (Ajzen, 1991) and physical activity (Kowalski, 1997) as described previously. Careful attention was paid to the design and layout of the questionnaire booklet to try and reduce the risk of errors in interpretation and recording of participant responses. All participants received verbal and visual instruction, using dummy items, regarding completion of the questionnaire booklet. The researcher answered any queries from participants.

3.112. Treadmill familiarisation

The researcher provided participants with detailed verbal instruction and carried out a practical demonstration regarding correct treadmill walking technique. The researcher controlled the speed on the treadmill at all times. Speed was increased only when the participants consented. The maximum speed of the treadmill during assessments was 1.34 m s⁻¹. Whilst walking, participants were encouraged to look straight ahead. Initially, participants used the supporting bars at the front of the treadmill (Figure 3.3) to facilitate balance and increase confidence, however walking without support was encouraged.

Figure 3.3. Participant undertaking a treadmill familiarisation



3.12. ASSESSMENTS

Demographic data were collected by questionnaire at each assessment point (sex, age, body mass, stature, body mass index and ethnicity). Socioeconomic status, based on residential postcode, was determined for each participant using the index of multiple deprivation (IMD) (Indices of deprivation, 2006) rank score. This measure of deprivation encompasses seven domains: income, employment, health and disability, education, skills and training, barriers to housing and services, living environment and crime. Assessments took place at baseline (week 0), mid-point of the exercise sessions (week 4), end of the exercise sessions (week 8), after the home programme (week 14) and at 12 weeks after the intervention follow-up (week 28). The mid-point assessments were included for monitoring purposes and not reported as outcome data. Stature was measured using a height board, graduated in cm and mm intervals. Body mass was measured on digital scales, zeroed daily. Body mass index standard deviation score (BMISds), flexibility, functional capacity, depression, affect, theory of planned behaviour and physical self-perceptions were also assessed at each of the assessment stages.

3.13. INTERVENTION PROCEDURE

3.131. Exercise therapy intervention

The exercise therapy intervention offered participants an opportunity to exercise using a number of different modalities. A range of activities were included as choice has been shown to facilitate retention and attendance in non-randomised studies (Holt, Bewick & Gately, 2005). Participants choose from dance-mats (Figure 3.4), cross-training/ski-machine (Figure 3.5) stepping, cycling (Figure 3.6), rowing, and walking (to prevent injury to the participant or researcher, an assessment of risk was undertaken, Appendix 4). Participants were required to exercise intermittently for 30 minutes. As obese individuals tend both to be sedentary and to have had poor experiences with exercise, intermittent exercise was deemed the most appropriate with this population (American College of Sports Medicine [ACSM], 2000).

Figure 3.4. Participant using the dance-mat

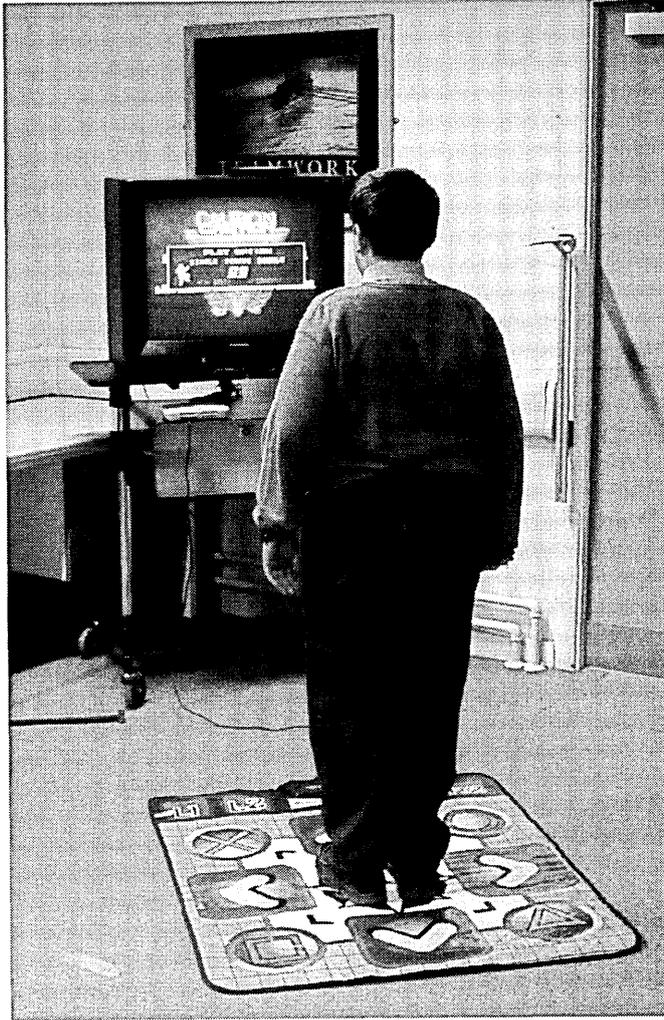


Figure 3.5. Participant using the ski-machine



Figure 3.6. Participant using the upright cycle



The intermittent exercise consisted of: (a) four minute warm-up; (b) four x four minute bouts of exercise at 40-59% of heart rate reserve³ (HRR) (moderate intensity exercise) with two minute rests between each bout (c) four minute warm-down. Heart-rate was recorded at the final minute of each exercise bout via short-range radio-telemetry monitor (Polar Research Unit, 1998). In addition to the exercise modalities, mini games were also incorporated into the session to promote adherence and retention. Each mini game was based on a score for a set time period: for example number of baskets scored in one minute. These mini games were primarily designed with fun in mind. However they also gave participants the opportunity to build esteem through improvements in self-efficacy, see personal development throughout the programme and to introduce a small self-referenced competitive element to the sessions (detailed outlines for each of the mini games used in the intervention can be found in Appendix 7). All sessions were conducted one-to-one with the researcher. The remainder of the session was devoted to exercise counselling as described in section 3.132. At the end of the intervention, participants randomised to the exercise therapy group were invited to complete a semi-structured interview (see Chapter 6.0.)

3.132. Exercise counselling

The exercise counselling component of the intervention aimed at providing participants with the necessary knowledge and psychological skills/tools to sustain their exercise behaviour upon completion of the study. The researcher encouraged participants to reflect on their thoughts and feelings about exercise. The exercise counselling took the form of discussions throughout the session. More direct information regarding exercise and diet was given at the end of each exercise period and often incorporated games such as pool, table football and table tennis, which helped to create a relaxed environment to facilitate discussion. The exercise counselling protocol (Table 3.1) was based on the processes of change described

³ Heart rate reserve is the difference between resting heart rate and maximum heart rate. The Karvonen et al., formula (1957) was used to calculate exercise intensity as a percentage of Heart Rate Reserve.

within the TTM for behaviour change (Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992).

3.133. Dietary advice

As part of the ethics requirements for this project, all participants were given a standard dietary advice at the start of their involvement. This took the form of an information sheet (Appendix 6), developed by a state registered dietician, outlining the importance of structured eating, healthy foods and suggesting ideas for meals. The information provided in the dietary sheet was supported by discussions between the participant and the researcher regarding what constituted a healthy diet.

3.134. Exercise placebo intervention

Similar to the exercise therapy, participants allocated to the exercise placebo group attended the trial centre three times per week for eight-weeks with sessions also lasting for one hour. Any placebo intervention must be relevant and meaningful, particularly when used with children and when blinding of the intervention is not possible, therefore this condition adopted a programme of functional strength exercises that focused upon the whole body.

Table 3.1. Exercise counselling protocol based on TTM processes of change

Weeks	Process of change	Exercise counselling framework: examples of skills and techniques used
1–2 Cognitive	Consciousness Raising	a. Review first session: <ul style="list-style-type: none"> • How did it feel? Was it difficult/easy? • Did you enjoy it? • Importance of exercise, why do we need to warm up & cool down • Heart rate monitoring, what to wear, what & when to drink • What to expect in the coming weeks. • Any questions
	Consciousness Raising	b. Healthy eating <ul style="list-style-type: none"> • What is it? • When should I eat? • What type of foods are good/not so good? • Hand out standard dietary information sheet
	Decisional Balance	c. Benefits of exercise <ul style="list-style-type: none"> • How often? • How hard? • Where and when?
3–4 Cognitive	Self Re-evaluation	d. Which physical exercises do I prefer? <ul style="list-style-type: none"> • Previous exercise experiences, why this worked / failed. • What other exercises might you like to try?
	Consciousness Raising	e. Do you know? <ul style="list-style-type: none"> • Benefits of exercise • Importance of healthy eating
	Decisional Balance	f. Are you enjoying the sessions? <ul style="list-style-type: none"> • What do you like? • What do you dislike? • What would you change? • Is it what you had expected?
	Consciousness Raising	g. Active and healthy living <ul style="list-style-type: none"> • Food groups, choices, portion sizes. • The breakfast challenge • Review healthy eating card.

Weeks	Process of change	Exercise counselling framework: examples of skills and techniques used
5–6 Cognitive and Behavioural	Self Re-evaluation	<p>h. Evaluate sessions so far</p> <ul style="list-style-type: none"> • How do you feel about exercise now? • How comfortable do you feel exercising? • Which exercises do you enjoy the most?
	Goal setting/Self-regulation	<p>i. Introduce goal setting</p> <ul style="list-style-type: none"> • What is it? • How might it help? • Set one exercise goal and one healthy eating goal for the week
	Helping Relationships	<p>j. Findings support for exercise</p> <ul style="list-style-type: none"> • Thinking of others who might encourage participation in exercise • Finding someone to talk to when exercising is difficult • Consider ways in which to exercise with other people
	7–8 Behavioural	<p>k. Review goals</p> <ul style="list-style-type: none"> • Did you achieve them? • If yes then well done! • If not then why not? What can we do to help change this?
	Stimulus Control	<p>l. Cues for action</p> <ul style="list-style-type: none"> • Thinking of tasks that might prompt participation in exercise
	Environmental Re-evaluation	<p>m. Thinking about moving on from the programme</p> <ul style="list-style-type: none"> • Home programme phase • Future exercise options
	Reinforcement Management	<p>n. Looking and planning ahead. SWOT analysis</p> <ul style="list-style-type: none"> • What will help me to exercise in the future? • What will stop me?
	Self-Liberation	<p>o. What have I achieved so far</p> <ul style="list-style-type: none"> • Review exercise • Review healthy eating • What do I want to achieve from here? • Thinking positively and taking positive action • What has been learned

Emphasis was placed on large through to small muscle groups and included rotation between upper (bicep curls); trunk (lower back strengthening) and lower (lunges) body exercises. To increase adherence, skill activities such as juggling and catching were included along with access to a pool table, table-football and table-tennis table. The conditioning sessions begun and concluded with passive stretching. Heart-rate monitors were worn throughout and care was taken that heart-rate was maintained at a level below 40% HRR to ensure that sessions did not replicate the exercise therapy environment. Participants assigned to the exercise placebo condition did not receive the exercise counselling outlined previously.

3.135. Usual care control group

Those randomised to the usual care control group attended the trial centre for the assessment weeks only. However, they were invited to attend free exercise sessions at the centre upon completion of the programme. Participants in the usual care control group received the same adherence incentives as the intervention groups.

3.14. HOME PROGRAMME

3.141. Home programme

Once participants completed the supervised exercise therapy and exercise placebo interventions respectively, they were asked to set five goals that would serve as an individualised home programme that they would try and follow for six-weeks. Participants were given a contact number for support and advice. The aim of the home programme phase was to promote autonomy and empower participants in becoming habitual exercisers. The home programme consisted of a goal setting sheet (Appendix 7) and an accompanying exercise diary (Appendix 8). Participants completed their goal sheet during the final intervention session. Weeks five and six of the exercise counselling intervention introduced the principles of goal setting and these principles were reinforced during the penultimate week of the exercise counselling. Participants were encouraged to set goals based on the principles

learned during the exercise counselling sessions. No attempt was made by the researcher to influence an individual's goals. The rationale for adopting a goal setting approach to the home programme phase is described briefly in section 3.142. Upon returning to the centre upon completion of the home programme phase the researcher reviewed the exercise diaries and goal sheets with the participant. A second semi-structured interview was conducted to further understand the benefits and limitations of the home programme both as a tool to maintain behaviour and monitor it (discussion of the main outcomes from this semi-structured interview can be found in Chapter 6.0, section 6.5).

3.142. Rationale for adopting a goal setting approach to the home programme

Goals enhance self-regulation through their effects on motivation, learning, self-efficacy and self-evaluations of progress (Bandura, 1997). Research has indicated that initially people must make a commitment to attain a goal because it will not affect performance without this commitment (Locke & Latham, 2002). Goals motivate people to make the effort necessary to achieve the task and in cases maintain this over time. Goals also direct individuals' attention to the relevant task. In essence it gives them a focus. Theoretically, goals themselves do not automatically enhance self-regulation; rather, it is the goal properties of specificity, proximity, and difficulty that are critical (Locke & Latham, 2002). These principles were outlined during weeks five and six of the exercise counselling and again reinforced during the final exercise therapy session when the goals were set. The principles are described in brief here; short-term goals provide immediate incentives and guides for action (Bandura, 1982, 1986) and provide clear markers of progress and verify any growing sense of self-efficacy. Pursuing easier goals might enhance self-efficacy and motivation during the early stages of behaviour change, but it is predicted that more challenging goals are more beneficial as behaviour change develops, as they offer more information about an individual's capability to change (Bandura, 1986). Goal specificity is also important. Being specific with goals can help maintain new behaviours through elevating self-perceptions of efficacy, as it is easier to judge progress toward a goal if

the performance standards are specific (e.g., “as a guide try and exercise five times per week for 30 minutes”), versus general (“just do your best with exercise”). In a study on fitness testing and goal setting, self-efficacy increased and performance improved when goals were specific and challenging (Fox & Biddle, 1988). It was concluded that process related goals such as effort, form, and strategy, and not outcome related goals such as win/loss, correct/incorrect, were more effective in raising levels of self-efficacy. For an obese individual this could mean setting appropriate goals that are not focused upon weight loss but instead have increases in physical activity as the aim.

3.143. The exercise diary intervention

Upon completion of the goal-setting sheet, participants were asked to record their progress using an exercise diary. The diary consisted of a week per page booklet that had prompts on each day for activities completed, difficulty of activity (based on RPE) and duration of activity. The researcher informed each individual that it was important to record activity accurately and not to be concerned if a day’s activity failed to be recorded. The researcher encouraged participants to use the exercise diary as a method of tracking progress over the six-week home programme phase.

3.144. Rationale for the use of an exercise diary intervention

Although considerable effort has been put into promoting exercise programmes to increase levels of physical activity, less attention has been paid to ensuring that individuals continue to engage with the principles of treatment, after the intervention. The exercise diary was designed to address this issue. It was hoped that the exercise diary would provide opportunity for self-regulation of behaviour and allow individuals to reflect on progress, strengthen self-efficacy therefore sustaining motivation. Whilst direct observation might be the most effective measure of physical activity patterns, practically this method is expensive and unrealistic. Another measurement type is self-report scales and in particular self-administered

recall/reporting. Self-administered reports or diaries are a common measure of children's physical activity due to their convenience of administration, low cost, and ability to collect a variety of physical activity variables over time (Sallis, 1992). When relying on children to recall and make honest reports of their physical activity patterns, concerns are likely regarding the accuracy of such measures (Baranowski, 1988). Baranowski (1988) stated that to improve the validity and reliability of self-report scales, measures must be taken to improve the cognitive processing of such data in children. In other words, children need to be given skills for accurate recall of their physical activity. The exercise counselling sessions attempted to provide all participants with the necessary skills to accurately recall and report their physical activity. Whilst, Sallis (1992) has suggested that self reported physical activity correlates only moderately with objective activity measures, the advantages of even moderate correlations on self-report scales seem to outweigh the disadvantages (e.g. cost, time, equipment) of direct observation in studies with large samples.

3.15. FOLLOW-UP ASSESSMENT AT 28-WEEKS

The final follow-up assessment took place 28-weeks after baseline. At this assessment participants were thanked for their ongoing commitment to the programme and were presented with a £10 sports shop voucher.

3.16. STATISTICAL ANALYSES

This study was a RCT, designed to evaluate the effect of an exercise therapy intervention on the physical self-perceptions of obese adolescents. A repeated measures mixed analysis of covariance (controlling for baseline scores) was used to compare outcomes between groups at eight-weeks, 14-weeks and 28-weeks from baseline. Data was analysed on an intention-to-treat basis therefore all participants were included in the analysis regardless of their level of adherence or compliance. The trial statistician was blinded to group codes.

4.0. RESULTS

4.1. SAMPLE CHARACTERISTICS

4.11. Demographics

The study sample consisted of 81 adolescents (36 males [44.4%] and 45 females [55.6%]). The mean age of the sample was 13.1 (SD 1.7) years with 58% (N=47) of the sample aged between 11-13 years and 42% (N=34) aged between 14-16 years. A total of N=63/81 (77.7%) were obese and N=18/81 (22.2%) participants were categorised as morbidly obese (BMI >3.5 SDS, adult equivalent BMI of ≥ 40). The sample consisted predominately of White children, 82.7% (N = 67), with a further 9.9% (N=8) and 7.4% (N=six) of Black and South Asian ethnicity respectively.

4.12. Socioeconomic status

IMD quartile rank scores indicated that 16% (N=13) of participants were living in quartile one (least deprived), 14.8% (N=12) quartile two, 17.3% (N=14) quartile three and 51.9% (N=42) in quartile four (most deprived).

4.13. Baseline psychopathology of sample

Recorded scores of PSPP (self-esteem) were low across all subscales at baseline in comparison with healthy child populations (Biddle et al., 1993). Scores for depression based on the CDI were high and indicative of probable depression (Kovacs, 1992), with 25 (30.3%) participants reporting a CDI score ≥ 13 . Furthermore, 22 participants (27%) reported that in the previous two weeks they had experienced suicidal thoughts as measured by the CDI (Kovacs, 1992).

4.2. RECRUITMENT CHARACTERISTICS

Participants were recruited between June 2002 and April 2005. The recruitment rate via paediatrician referral/invitation was 48% (N=47/98). Figure 4.1 depicts the recruitment process and attrition. At baseline all groups were comparable for study outcomes. Baseline scores according to groups are shown in Table 4.1. There was no multivariate effect for recruitment route indicating that participants did not vary on the study outcomes according to whether they entered the trial via hospital referral or community advertisements.

4.3. COMPLETION OF ASSESSMENTS

Completion of assessment rates for the exercise therapy and exercise placebo groups (determined by completion of eight-week follow-up assessment) were high. Of those participants randomised to exercise therapy (N=28) and exercise placebo (N=23), 98% (N=50) completed the eight-week intervention period. The only participant (exercise therapy group) who failed to return for the eight-week assessment did so due to personal reasons unrelated to the study. Of those randomised to the usual care control condition (N=30) six failed to return for the eight-week assessment. These six participants cited 'randomisation to the control group' as the reason for withdrawing from the study.

4.4. ADHERENCE TO INTERVENTIONS

For the exercise therapy group, 25/28 (89%) participants attended at least 80% (19/24) of intervention sessions. Similar rates occurred in the exercise-placebo group with 19/23 (83%) participants attending at least 80% (19/24) of exercise-placebo sessions. Little's D test was employed to assess whether the missing values were missing completely at random (MCAR). Little's D test $\chi^2=467.85$, $df=503$, $p=0.87$ indicated that missing data were completely at random and therefore the complete case analysis may produce unbiased estimates (see Figure 4.1 for information regarding the number of participants lost to follow-up).

Figure 4.1. Flowchart showing trial recruitment process

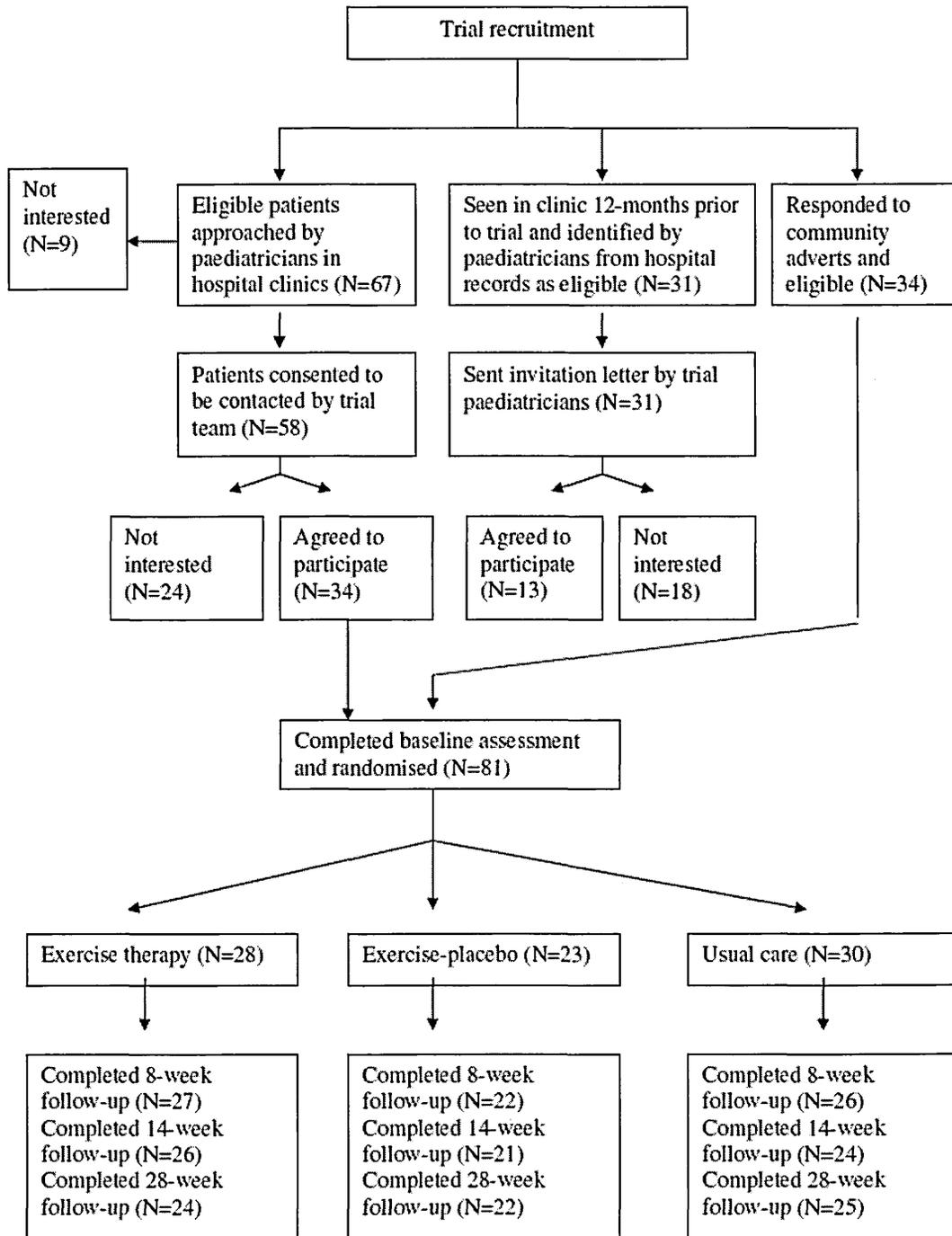


Table 4.1. Baseline scores for study outcomes according to group*

Outcome	Exercise therapy Mean (SD)	Exercise-placebo Mean (SD)	Usual care Mean (SD)
Physical self-perceptions (score range =1-4)			
Physical self-worth (psw)	1.83 (0.47)	1.91 (0.52)	1.97 (0.46)
Global self-worth (gsw)	2.42 (0.56)	2.49 (0.59)	2.49 (0.49)
Sport/athletic competence	2.20 (0.55)	2.17 (0.71)	2.03 (0.51)
Conditioning/stamina competence	1.92 (0.46)	2.04 (0.70)	1.97 (0.57)
Attractive body adequacy	1.48 (0.39)	1.67 (0.35)	1.59 (0.38)
Strength competence	2.48 (0.77)	2.52 (0.72)	2.43 (0.64)
Self-perceptions (score range=1-4)			
Scholastic competence	2.51 (0.31)	2.64 (0.32)	2.59 (0.23)
Social competence	2.46 (0.36)	2.46 (0.43)	2.47 (0.24)
Depression (CDI) and Affect (score range =0-54 & 1-5)			
Depression (n=80)	11.1 (6.04)	10.1 (8.18)	9.1 (6.37)
Positive affect	3.39 (0.81)	3.17 (0.72)	2.97 (0.72)
Negative affect	2.10 (0.67)	2.13 (0.98)	2.03 (0.92)
TPB (score range 1-7)			
Subjective norm	5.96 (1.07)	6.38 (0.82)	5.91 (0.94)
PBC	4.84 (0.94)	4.91 (0.72)	4.57 (0.94)
Intent	4.69 (0.80)	4.57 (0.69)	4.28 (0.91)
Attitude (N=56)	2.00 (0.77)	2.01 (0.85)	1.79 (0.72)
Physiological outcomes			
Resting heart rate (bpm)	84 (4)	82 (8)	85 (11)
Aerobic function (miles) (N=80)	0.39 (0.02)	0.36 (0.10)	0.38 (0.12)
BMI (SDS)	3.17 (0.33)	3.22 (0.61)	3.32 (0.37)
Physical activity (score range 0-170)	60.9 (11.5)	61.2 (9.62)	59.5 (8.71)

*N=81 unless stated.

4.5. PSYCHOPATHOLOGICAL OUTCOMES

4.5.1. Physical self-perceptions (self-esteem)

Table 4.2 displays adjusted (for baseline) mean scores for each group across all time points. Differences in adjusted mean physical self-worth (PSW) scores between the exercise therapy and usual care control groups at eight-weeks (mean difference=0.21; $p=0.02$), 14-weeks (mean difference=0.26; $p=0.03$) and 28-weeks (mean difference=0.23; $p=0.04$) were recorded. There was a significant difference in adjusted mean PSW between the exercise-placebo and usual care control groups at eight-weeks (mean difference=0.20; $p=0.02$). Differences equate to improvements of between 5.3–6.5% in favour of exercise therapy.

Analyses revealed a significant difference in global self-worth (GSW) adjusted mean scores between exercise therapy and exercise-placebo at 14-weeks (mean difference=0.49; $p=0.002$) and 28-weeks (mean difference=0.42; $p=0.003$). Differences equate to improvements of between 10.5-12.3%, favouring exercise therapy. A significant difference between exercise-placebo and usual care at 14-weeks was observed for GSW scores (mean difference=0.36; $P=0.008$). A significant difference in adjusted mean strength competence scores between exercise therapy and usual care at eight-weeks was noted (mean difference=0.27; $P=0.03$); this effect continued until 14-weeks (marginal, mean difference=0.31; $p=0.06$, 6.8-7.8% improvement). Examination of the adjusted mean indicates a similar pattern over time for exercise therapy and usual care for attractive body adequacy scores, both groups having a reduction in score at 14-weeks but improving beyond the initial eight-week adjusted mean score by the 28-weeks. Scores for exercise-placebo also declined at 14-weeks, but failed to regain the initial eight-week adjusted mean score by 28-weeks. There was evidence of a significant difference between exercise therapy and exercise-placebo at 28-weeks (mean difference=0.22; $P=0.045$, 5.5% improvement) for this outcome.

Table 4.2. Adjusted (for baseline) mean scores for each group across follow-ups

Outcome	Mean \pm SE			F statistic	
	Exercise therapy	Exercise placebo	Usual care	Group effect	Group*time effect
Physical self-perceptions (pspp) (score range = 1-4)					
Physical self-worth (psw)					
8-weeks	2.14 (0.07)	2.14 (0.07)	1.94 (0.05)	3.53, ($p=0.03$)	1.37, ($p=0.25$)
14-weeks	2.02 (0.10)	1.88 (0.13)	1.77 (0.06)		
28-weeks	2.22 (0.09)	2.03 (0.07)	1.99 (0.06)		
Global self-worth (gsw)					
8-weeks	2.61 (0.08)	2.56 (0.10)	2.56 (0.07)	3.65, ($p=0.03$)	3.30, ($p=0.01$)
14-weeks	3.02 (0.11)	2.52 (0.11)	2.88 (0.07)		
28-weeks	2.86 (0.10)	2.44 (0.09)	2.66 (0.07)		
Sport/athletic competence					
8-weeks	2.36 (0.10)	2.36 (0.09)	2.20 (0.06)	2.06, ($p=0.14$)	2.06, ($p=0.09$)
14-weeks	2.23 (0.13)	2.04 (0.14)	1.95 (0.09)		
28-weeks	2.45 (0.09)	2.16 (0.08)	2.22 (0.08)		
Conditioning competence					
8-weeks	2.20 (0.09)	2.09 (0.08)	2.00 (0.05)	2.32, ($p=0.11$)	0.54, ($p=0.71$)
14-weeks	2.16 (0.13)	1.86 (0.11)	1.87 (0.08)		
28-weeks	2.29 (0.11)	2.05 (0.10)	2.08 (0.06)		
Attractive body adequacy					
8-weeks	1.84 (0.08)	1.87 (0.11)	1.82 (0.06)	0.15, ($p=0.86$)	2.80 ($p=0.03$)
14-weeks	1.46 (0.08)	1.54 (0.14)	1.38 (0.06)		
28-weeks	1.91 (0.06)	1.69 (0.09)	1.88 (0.08)		
Strength competence					
8-weeks	2.67 (0.10)	2.51 (0.10)	2.39 (0.08)	3.10, ($p=0.051$)	0.12, ($p=0.97$)
14-weeks	2.67 (0.12)	2.51 (0.16)	2.36 (0.12)		
28-weeks	2.45 (0.11)	2.34 (0.11)	2.27 (0.07)		

Table 4.2. Adjusted (for baseline) mean scores for each group across follow-ups

Outcome	Mean ± SE			F statistic	
	Exercise therapy	Exercise placebo	Usual care	Group effect	Group*time effect
Self-perceptions (score range =1-4)					
Scholastic competence					
8-weeks	2.93 (0.13)	2.78 (0.15)	2.78 (0.12)	1.06, (<i>p</i> =0.35)	1.08, (<i>p</i> =0.95)
14-weeks	3.00 (0.12)	2.71 (0.16)	2.90 (0.12)		
28-weeks	3.01 (0.12)	2.66 (0.15)	2.86 (0.13)		
Social competence					
8-weeks	2.90 (0.11)	2.73 (0.14)	2.73 (0.12)	0.78, (<i>p</i> =0.46)	0.18, (<i>p</i> =0.45)
14-weeks	2.94 (0.11)	2.83 (0.13)	2.80 (0.09)		
28-weeks	3.02 (0.13)	2.81 (0.09)	2.84 (0.10)		
Depression (CDI) and affect (score ranges = 0-54 & 1-5)					
Depression					
8-weeks	7.68 (1.07)	8.32 (1.28)	8.23 (1.20)	0.47, (<i>p</i> =0.63)	0.28, (<i>p</i> =0.89)
14-weeks	6.25 (1.08)	7.29 (1.18)	7.33 (1.45)		
28-weeks	4.57 (1.04)	6.12 (1.15)	6.64 (1.29)		
Positive affect					
8-weeks	3.49 (0.13)	3.39 (0.16)	3.16 (0.09)	2.24, (<i>p</i> =0.11)	1.68, (<i>p</i> =0.16)
14-weeks	3.16 (0.11)	3.06 (0.21)	3.10 (0.13)		
28-weeks	3.52 (0.10)	3.24 (0.18)	3.13 (0.11)		
Negative affect					
8-weeks	1.93 (0.14)	2.13 (0.19)	1.72 (0.13)	0.48, (<i>p</i> =0.62)	0.86, (<i>p</i> =0.49)
14-weeks	1.92 (0.13)	1.83 (0.14)	1.82 (0.14)		
28-weeks	1.84 (0.15)	1.78 (0.16)	1.80 (0.13)		

Table 4.2. Adjusted (for baseline) mean scores for each group across follow-ups

Outcome	Mean \pm SE			F statistic	
	Exercise therapy	Exercise placebo	Usual care	Group effect	Group*time effect
Theory of Planned Behaviour (score range = 1-7)					
Subjective norm					
8-weeks	6.43 (0.13)	6.15 (0.17)	6.17 (0.12)	1.06, ($p=0.35$)	1.20, ($p=0.31$)
14-weeks	6.49 (0.15)	6.40 (0.13)	6.36 (0.17)		
28-weeks	6.65 (0.16)	6.45 (0.17)	6.24 (0.19)		
PBC					
8-weeks	5.31 (0.13)	5.09 (0.15)	4.61 (0.16)	7.25, ($p=0.0014$)	0.40, ($p=0.81$)
14-weeks	5.35 (0.16)	5.21 (0.17)	4.57 (0.15)		
28-weeks	5.31 (0.17)	5.05 (0.16)	4.59 (0.14)		
Intent					
8-weeks	5.74 (0.20)	5.88 (0.18)	5.37 (0.27)	1.12, ($p=0.33$)	0.58, ($p=0.67$)
14-weeks	5.76 (0.20)	6.00 (0.19)	5.75 (0.13)		
28-weeks	5.68 (0.19)	5.88 (0.16)	5.78 (0.09)		
Attitude (N=56)					
8-weeks	2.28 (0.10)	1.93 (0.28)	1.71 (0.11)	8.94, $p=0.0005$	0.95, $p=0.44$
14-weeks	3.00 (0.10)	1.99 (0.14)	1.56 (0.14)		
28-weeks	2.25 (0.13)	2.13 (0.14)	1.72 (0.12)		

Table 4.2. Adjusted (for baseline) mean scores for each group across follow-ups

Outcome	Mean ± SE			F statistic	
	Exercise therapy	Exercise placebo	Usual care	Group effect	Group*time effect
Physiological outcomes					
Resting heart rate					
8-weeks	80.42 (0.96)	82.16 (0.92)	81.29 (0.96)	0.72, p=0.49	0.73, p=0.58
14-weeks	80.38 (0.79)	81.14 (1.05)	81.62 (0.98)		
28-weeks	79.37 (0.76)	80.24 (1.01)	81.12 (1.10)		
Aerobic function (miles)					
8-weeks	0.39 (0.02)	0.38 (0.01)	0.36 (0.01)	1.20, p=0.31	0.50, p=0.74
14-weeks	0.39 (0.02)	0.38 (0.01)	0.35 (0.02)		
28-weeks	0.39 (0.02)	0.37 (0.01)	0.36 (0.01)		
BMI (sds)					
8-weeks	3.23 (0.02)	3.24 (0.02)	3.23 (0.02)	0.58, p=0.56	0.71, p=0.59
14-weeks	3.22 (0.03)	3.24 (0.03)	3.22 (0.03)		
28-weeks	3.16 (0.04)	3.23 (0.04)	3.17 (0.05)		
Physical activity ¹					
8-weeks	70.24 (2.02)	69.25 (2.92)	64.38 (2.38)	4.19, p=0.02	1.76, p=0.14
14-weeks	71.31 (2.31)	68.31 (2.43)	63.07 (2.52)		
28-weeks	72.97 (2.12)	63.16 (2.17)	63.12 (2.28)		

¹Total scores ranged from 0 -170

4.52. Depression and affect

There was no evidence of differences in depression or positive or negative affect between the groups at any of the follow-up assessments.

4.53. Theory of planned behaviour (TPB)

A difference in adjusted mean perceived behavioural control (PBC) scores between exercise therapy and usual care were recorded at eight-weeks (adjusted mean difference of 0.70, $p=0.001$). This effect was also seen at 14 and 28-week follow-ups respectively (mean difference =0.78, $p=0.0006$; mean difference =0.72, $p=0.002$). Differences were also seen between exercise placebo and usual care, at eight-weeks (mean difference 0.48, $p=0.04$; 14-weeks 0.64, $p=0.007$ and 28-weeks 0.45, $p=0.04$).

4.6. PHYSIOLOGICAL OUTCOMES

4.61. Activity

A marginal difference in adjusted mean physical activity score was observed at eight-weeks between exercise therapy and usual care (mean difference=5.9; $p=0.06$) followed by a significant difference at later follow-ups; mean differences at 14-weeks and 28-weeks were 8.24; $p=0.02$ and 9.84; $p=0.002$ respectively. At 28-weeks those participants randomised to exercise therapy reported significantly greater scores for physical activity compared with exercise-placebo (mean difference=9.81; $p=0.0016$). These significant differences equate to improvements of between 4.8-5.8% for exercise therapy.

4.62. BMI

No differences for BMI were recorded between groups at all assessment points. Baseline scores for BMI revealed that all but three participants (96.3% of sample) recorded BMI scores above the 99.6th (+2.6 SDS) percentile.

4.63. Heart rate during sessions

Table 4.3 contains average HR data from the exercise therapy and exercise-placebo groups during the interventions. Based on data in Table 4.3, participants randomised to exercise therapy, exercised between 40-59 %HRR for the duration of the intervention. Participants allocated to exercise placebo (body-conditioning) exercised at an intensity ≤ 40 HHR for the duration of the intervention. These calculations are based on the mean age of the sample (13.1 years) and the mean resting heart rate for participants randomised to exercise therapy (80bpm) and exercise placebo (82bpm) respectively. HR was maintained in accordance with trial protocols.

4.8. HOME PROGRAMME RESULTS

Analysis of the home programme phase was carried out using data from participants randomised to the exercise therapy group. Of those randomised to the exercise therapy condition (N=28, N=16 girls, N=12 boys) 18 participants returned the exercise diary and goal sheet complete. Of those, five (42%) were boys and 13 (81%) were girls. Goals ranged from those that focused on increasing physical activity and /or reducing sedentary behaviour to nutrition orientated outcomes such as eating breakfast or reducing carbonated drink consumption and increasing water intake. Figure 4.2 illustrates the ratio of goals set to goals achieved for outcomes relating to both physical activity and nutrition. The most frequently reported physical activity goals were sit-ups (N=14), walking (N=13) and swimming (N=7). Reducing snacking (N=8), eating breakfast (N=7) and increasing fruit and vegetable intake (N=9) were the most frequently set nutrition orientated goals. Of the physical activity goals and nutrition goals set, 64% and 70% were achieved respectively. The average number of goals achieved by participants was three. Girls achieved 68% of the goals set whereas boys achieved 64% (see Table 4.4. for the range and ratio of goals set/achieved for the home programme phase).

Table 4.3. Overall means (standard deviations) for heart rate during the exercise therapy and exercise-placebo interventions

	Exercise therapy	Exercise-placebo
	N=28	N=23
	Mean (SD)	Mean (SD)
Week 1-2 (sessions 1-6)	149.7 (8.2)	118.6 (8.7)
Weeks 3-4 (sessions 7-12)	148.5 (7.2)	117.8 (7.0)
Weeks 5-6 (sessions 13-18)	149.0 (7.9)	119.2 (7.1)
Weeks 7-8 (sessions 19-24)	150.3 (7.9)	119.8 (6.8)

Figure 4.2. Comparison of goal success during the home programme

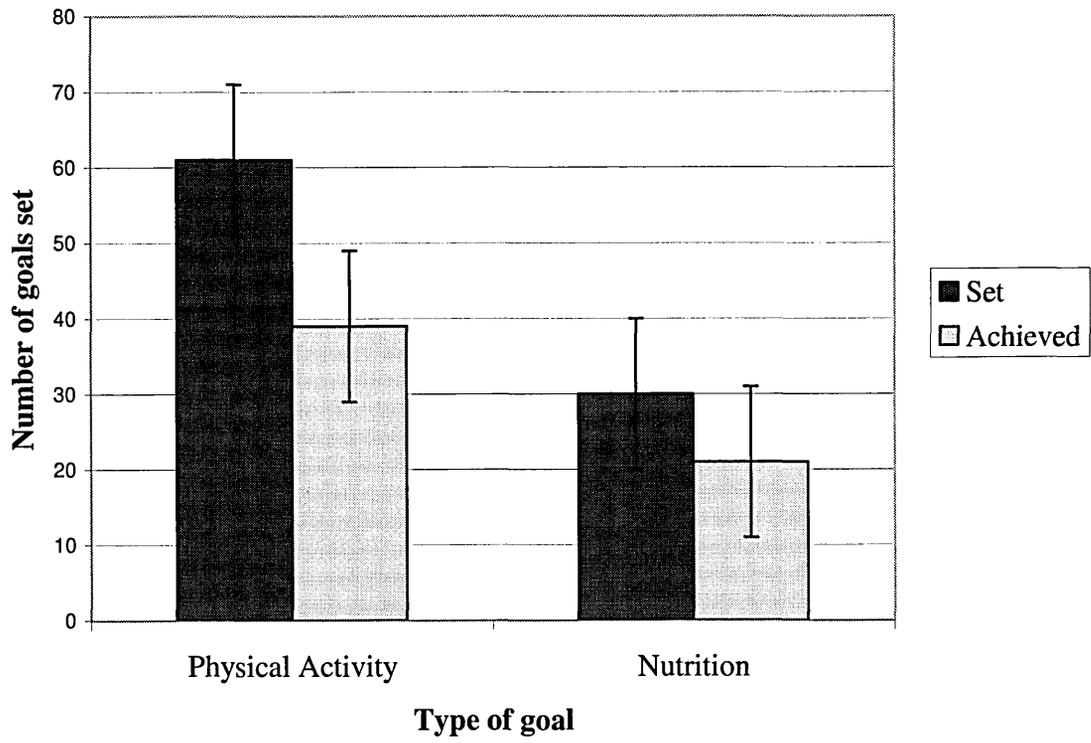


Table 4.4. Range and ratio of goals set and goals achieved for the home programme

Goal	Number set	Number Achieved	Percentage
Physical Activity			
Sit-ups	14	11	79
Brisk Walking	13	9	69
Swimming	7	5	71
Riding a Bike	7	4	57
Sporting activities	6	2	33
Dance	2	2	100
Other	9	6	66
<i>Overall Total</i>	<i>61</i>	<i>39</i>	<i>64</i>
Nutrition			
Reducing snacking	8	6	75
Increasing Fruit & Vegetable intake	9	6	66
Eating Breakfast	7	6	86
Increasing water intake	3	2	66
Increasing Sleep	1	0	0
Other	2	1	50
<i>Total</i>	<i>30</i>	<i>21</i>	<i>70</i>

5.0. DISCUSSION

5.1. RESEARCH PROGRAMME SUMMARY

Obesity in childhood and adolescents can affect future QoL (Story et al., 2002), and increase the risk of psychopathology (Friedlander et al., 2003; Schwimmer et al., 2003; Sjöberg et al., 2005). However, the treatment of psychopathology is not a priority for most obesity intervention programmes. Instead, the majority of research has focused on the physical consequences associated with the disease with most interventions unsuccessful over time (Summerbell et al., 2003). There is little evidence from investigations of the psychosocial aspects of obesity in children and young people drawn from the UK (Sweeting, Wright & Minnis, 2005). Instead, studies have been limited to clinically-based research in the United States, often with small sample sizes ($n \leq 50$) and involving motivated, predominately white middle class families (Summerbell et al., 2003), making it difficult to generalise the findings across a range of socio-economic populations. Further, no published trial has included an equal contact exercise-placebo arm, allowing for a more stringent test of exercise as a clinically meaningful treatment by equating social contact between the groups. Therefore, the primary aim of this study was to determine the effect of exercise as a psychological therapy for the treatment of psychopathologic outcomes in obese adolescents. Changes in physical activity, physical fitness and BMI were also investigated. As the exercise experiences of obesity young people presenting for treatment are also often overlooked within the literature it was the secondary aim of this study to address these shortfalls.

5.2. BASELINE PSYCHOPATHOLOGY

Participants here reported baseline psychopathology scores comparable with paediatric cancer patients who typically live with a life threatening illness (Magal-Vardi et al., 2004).

Expressions of suicidal ideation were common and in line with previous research (Eisenberg,

Neumark-Sztainer & Story, 2003). Significant depressive symptom scores were also recorded for a large percentage of the sample population. Morbidly obese individuals reported higher total CDI scores (depression); the mean (12.9) approached the 13-point cut-off score used to screen for depression in clinical populations (Kovacs, 1992). The high depressive symptom scores observed in the morbidly obese group is very worrying given the long-term negative quality of life consequences that can result from being severely obese. In obese children not seeking treatment, previous research (Friedman & Brownell, 1995), including systematic reviews (Wardle & Cooke, 2005) has suggested that the link between obesity and depression is modest and even negligible. However, findings here, confirmed by observational studies (Dong Li, Li & Price, 2006; Erikson, Robinson, Haydel & Killen, 2003) indicate obese populations seeking treatment are at high risk of psychopathology underlining the need for the trial in the first instance. Furthermore, interventions aimed at treating childhood obesity must consider psychopathologic factors in their approach, with evaluation of treatments that have potential to attenuate such symptoms, critical.

Participants reported low baseline scores for PSPP subscales with morbidly obese individuals recording lower global self-worth scores than obese participants, lending support for previous research with obese young people (Eisenberg et al., 2003; Erikson et al., 2003). Domains of physical self-worth, attractive body adequacy, conditioning/stamina competence and sport/athletic competence were markedly lower than scores recorded in a convenience sample of 134 UK adolescents (Gilson, Cooke & Mahoney, 2005). Data from Gilson and colleagues (2005) is especially relevant as it was sampled from children based in Leeds (UK), with similar demographics, ethnicity and socio-economic status as the sample reported in this study. The comparatively low baseline PSPP scores are particularly concerning because domains of physical self-perceptions have been shown to influence young people's moderate intensity physical activity (Sallis, Prochaska, & Taylor, 2000). If this is the case, obese children with low self-esteem might be unlikely to engage in a lifestyle that involves regular

physical activity, therefore failing to improve their health status, without assistance from interventions that promote increases in physical self-perceptions.

5.3. EFFECTS OF EXERCISE THERAPY ON PSYCHOPATHOLOGY OUTCOMES

5.3.1. Physical self-perceptions and self-perceptions

Relative to usual care, a randomised eight-week exercise therapy intervention had a positive affect on the PSW of obese children seeking treatment, both in the short and longer-term. Changes observed are similar to those for non-randomised research (Barton et al., 2004; Gately et al., 2000, 2005; Walker et al., 2003) and related reviews (Ekeland, Heian & Hagen, 2005). This study adds to the current body of knowledge given the failure of previous RCT's to address psychopathology issues with obese adolescents (Summerbell et al., 2003). There are several possible explanations for the observed change in PSW of exercise therapy participants. Firstly; the way in which obese adolescents feel about their bodies is likely to be heavily implicated in the extent to which they participate in physical activity. By engaging in consistent bouts of physical activity, obese young people have the potential to alter body composition (Saris, 1993; Schwingshandl, et al., 1999; Sothorn et al., 1999) and potentially influence psychopathology as demonstrated by several studies (Barton et al., 2004; Dong, et al, 2006; Gately et al., 2000 & 2005; Walker, Gately, Bewick & Hill, 2003). However, it seems unlikely that obese adolescents will engage in sufficient amounts of regular exercise, unless they have had opportunities to experience some sense of efficacy from participation. With this in mind, it is possible that exercise therapy in this study provided participants with the opportunity to experience a sense of achievement regarding their physical self by fostering feelings of competence and altering attitudes towards exercise. This is supported by the higher PSW and GSW scores reported across time with exercise therapy compared to both exercise-placebo and usual care and substantiated through exercise therapy participants recording significantly greater amounts of physical activity at follow-up relative to these groups.

Secondly; supported by low attrition rates and comments from the semi-structured interviews (discussed in more detail in Chapter 6.0) it is also likely that the short-bouts of intermittent, moderate intensity exercise used within the current study were achievable for the exercise therapy participants. The continuous successful completion of a task has been shown to build efficacy beliefs (Bandura, 1986) and therefore it could be argued that the intervention protocol adopted here might have positively influenced self-efficacy by providing participants with a source of mastery experiences. Although, self-efficacy was not measured directly, the improvement in PSW in favour of exercise therapy appears to substantiate this claim.

Thirdly; providing obese individuals with an enjoyable experience of exercise has been shown to influence domains of self-esteem in non-randomised research (Gately et al., 2000 & 2005; Walker et al., 2003). Indeed, children who feel that physical activity is enjoyable are more likely to participate consistently (Craig, Goldberg & Dietz, 1996). Interview responses indicated that exercise therapy sessions were fun and enjoyable suggesting that exercise therapy is a treatment that obese young people are prepared to engage with. Furthermore, by adhering to protocol consistently, obese young people could achieve positive change in physical self-perceptions, which might lead to modest changes in behaviour. When set against a backdrop of evidence that shows obese individuals are often sedentary (Hughes, Henderson, Ortiz-Rodriguez, Artinou & Reilly, 2006) as a result of feeling negatively about their bodies and having low actual and/or perceived physical competence (Okley, Booth & Patterson, 2001) the potential positive impact of exercise therapy on psychopathologic outcomes in obese young people is highlighted. What is clear from the outcomes of this study is that providing obese children and adolescents with appropriate and enjoyable opportunities to be physically active is central to promoting changes in self-esteem. This view is supported by research investigating the determinants of youth physical activity, from which Sallis and

Owen (1999) suggested that interventions that build perceptions of self-efficacy and provide enjoyable activities for children, would be most effective.

The improvements in PSW maintained at 28-week follow-up in exercise therapy participants might be explained by the characteristics of the motivational process thought to underpin the personal self-perception -physical activity relationship. According to Fox and Corbin (1989) an individual's perceptions of competence and athletic ability are central to their motivation to participate in physical activity. This perspective receives support from Harter's (1978) competence motivation theory (CMT), which suggests individuals are more likely to participate in behaviours (such as physical activity) if they are high in perceived competence (how good they think they are at the behaviour) and hold high expectations of a successful outcome for that behaviour. As mentioned previously, it is likely that the accumulation of mastery experiences facilitated by short intermittent bouts of achievable activity were integral to the development and maintenance of self-esteem reported by exercise therapy participants. The results also suggest that by providing obese individuals with an opportunity to exercise in a supportive environment that assumes an approach that promotes competence in a range of skills, perceptions of competence can be maintained over the longer term. In support of this, post-intervention changes in PSW were not maintained for the exercise placebo participants at follow-up indicating that the inclusion of exercise counselling and aerobic activity in interventions might contribute to the maintenance of self-esteem among obese individuals over and above the impact of attention factors alone. The longer-term positive effects of PSW in favour of exercise therapy could also be explained in terms of the physical signs associated with exercise. Whilst it is unlikely that the intensity and duration of exercise adopted within the exercise therapy sessions was sufficient to produce significant changes in physical fitness and weight status, it is reasonable to suggest that it might have promoted small changes in muscle tone and body shape, although these outcomes were not measured. Any change in

body shape for a population who often feel that there is very little that they can do to change body composition might sustain feelings of PSW and support health behaviour change. In support of this exercise can provide proprioceptive feedback regarding improvements in the overall tone and functional ability of obese individuals' bodies (Foreyt & Goodrick, 1995), which in turn could positively influence body perceptions and attitudes towards physical activity in obese young people.

5.32. Depression

There was no evidence that exercise therapy had a significant effect on depression or affect. This is in contrast with previous non-randomised research suggesting the adoption of an aerobic programme of exercise is useful in treating depression with overweight adolescents (Stella et al., 2005). However, Martinsen (1994) reported that whilst aerobic exercise might be as effective as any other therapy in the rehabilitation of depressed patients; treatment has only been shown to be effective for individuals with average to moderate depression. With this in mind, a possible explanation for our findings is that the sample reported depressive symptom scores that were higher than average to moderate. Participants (N=25) reported a CDI score >13, which is consistent with clinically significant depressive symptoms. The morbidly obese individuals registered CDI scores approaching the cut-off score for depression in clinical populations (Kovacs, 1992) with a large percentage of participants (27%) expressing suicidal ideation. These data are particularly concerning and not only confirm that obese populations are at high risk of psychopathology (Sjöberg, Nilsson & Leppert, 2005) but that aerobic activity might not be effective as a standalone treatment supporting the need for further research in this field. Although no significant differences were noted between the groups for measures of depression, the fall in baseline adjusted total depression scores over the treatment period and at follow-up favoured exercise therapy. This suggests that whilst the attention affects of the exercise placebo might have encouraged participants to feel positive about their physical selves and thus influence depression, for exercise therapy participants the

addition of aerobic exercise offered further benefit. This view is supported by previous research (Biddle, et al., 1998; Mutrie & Biddle, 1995) and related reviews (Larun, Nordheim, Ekeland, Hagan & Heian, 2006). Whilst there is some evidence of the positive effect of exercise upon depression in children (Annesi, 2005b; Stella et al., 2005) a recent Cochrane review concluded that given the very small number of studies focusing on the effects of exercise upon depression it is impossible to determine which is the most effective intensity, mode and/or duration in producing anti-depressive effects (Larun et al., 2006), which might explain the lack of significant results here. While current guidelines on identification and management of depression in children and young people suggest regular exercise should be part of a treatment intervention (National Institute for Clinical Excellence [NICE], 2005), it is clear that further studies are required. This seems particularly important for obese young people who often present to treatment with serious forms of psychopathology.

5.33. Affect

Adjusted scores of positive affect were higher across all time points for exercise therapy compared to the exercise placebo and usual care control groups. Whilst these differences did not receive significant statistical support, follow-up trends are consistent with improvements in PSW and GSW in favour of exercise therapy. Despite participants reporting that the exercise therapy intervention was fun and enjoyable during the semi-structured interviews, with statistical support for a change in physical self-perception domains, it seems surprising that there was no evidence of a change in affect. Previous studies have supported a link between exercise and positive affect in children (Annesi, 2005a) with data suggesting that short bouts of physical exercise have psychological benefit (Williamson, Dewey & Steinberg, 2001). However, this was not supported here. Interestingly, there is some evidence that positive mood state can worsen particularly for adolescents in early puberty, when exercise progresses past 20-minutes duration (Robbins, Pis, Pender & Kazanis, 2004). Further research

is required to fully understand the relationship between exercise and mood particularly with the obese adolescent population.

5.4. THEORY OF PLANNED BEHAVIOUR

The significant difference in perceived behavioural control (PBC) at the eight-week follow-up in favour of exercise therapy suggests that individuals in this group might have been empowered and in control of their choice to engage in health promoting behaviours. PBC indicates that an individuals' motivation is influenced by how difficult the behaviours are perceived to be, as well as the perception of how successfully the individual can, or can not, perform the activity. This perception can reflect past experiences, anticipation of upcoming circumstances, and the attitudes of the influential norms that surround the individual (Mackenzie & Jurs, 1993). It could be argued that the significant improvements noted for exercise therapy in PBC not only show an understanding of the benefits of health behaviours such as exercise and an appreciation of the potential advantages and disadvantages of initiating such behaviours, but more importantly the confidence to maintain them long-term. Promotion of this cognitive appraisal was central to the exercise-counselling model adopted in the trial. The higher PSW and GSW scores across time and greater amounts of physical activity reported at follow-up relative to the exercise-placebo and usual care groups support the transition from cognitive appraisal to actual behaviours. Not only did the exercise therapy intervention help participants feel better physically and globally but it appears it also empowered them to increase their physical activity. Findings support the use of TTM based activities, namely the processes of change model described in Table 4.1, as a means of promoting behaviour change during exercise therapy sessions. Larger trials that investigate fully the mechanisms of change resulting from exercise therapy are required to fully determine its use as a tool in the treatment of childhood obesity. However, the results here are certainly encouraging.

5.5. CONTROLLING FOR THE EFFECTS OF ATTENTION: EXERCISE PLACEBO

In the short term, the associated attention effects of the exercise therapy intervention are unclear. Participants in exercise therapy and exercise placebo reported significantly improved PSW scores, relative to usual care at eight-week follow-up. This suggests that both interventions provided short-term benefit. Placebo control protocols need to be ones that individuals are motivated enough to use. As attrition rates were low, it is reasonable to suggest that the exercise-placebo group might have enjoyed a sense of achievement from their body conditioning sessions, raising perceived competence and thereby gaining support for the motivational processes thought to underpin the personal self-perception-physical activity relationship presented by Fox and Corbin (1989). Furthermore, with all participants in this study recording very low physical activity scores at baseline, it is possible that any increase in perceived activity could elicit change in physical self-perception domains. However, it is unlikely that exercise-placebo participants would have witnessed any concurrent change in muscle tone or body shape due to the nature of the activities they performed, as demonstrated by heart rate data (see Table 4.3.). This might also explain the failure of this group to maintain change in PSW scores at 14 and 28-week follow-up. It is also conceivable that those children randomised to exercise-placebo increased their level of activity outside of the exercise-placebo sessions thereby deriving associated psychosocial benefit (Biddle et al, 1998; Biddle & Mutrie, 2001).

Due to the one-to-one intervention design, the influence of experimenter effect could offer an explanation for the PSW scores reported by the exercise placebo condition at eight-week assessment. The experimenter effect is a term used to describe any of a number of subtle cues (unconscious, nonverbal) or signals (vocal cues, such as tone of voice) from an experimenter/therapist that affect the performance or response of subjects in the experiment. Research has demonstrated that the expectations and biases of an experimenter can be

communicated to experimental participants in subtle, unintentional ways, and that these cues can significantly affect the outcome of the experiment (Rosenthal, 1998). This could be particular the case for obese individuals who are often targets of bullying (Morgan, Tanofsky-Kraff, Wilfley & Yanovski, 2002; Zimetkin, et al., 2004) lack self-esteem or confidence (Swallen, Reither, Haas & Meier, 2005) and tend to be peripheral to social networks (Strauss & Pollack, 2000). The influence of experimenter effect has also been an issue for camp-based studies, with authors suggesting the residential nature and supportive social environment of the camp might account for any reported change in psychopathologic outcomes rather than the exercise intervention itself (Gately et al., 2005). The failure of the exercise-placebo group to maintain changes in PSW at 14-week and 28-week follow-up offers support for this suggestion, strengthening the call for researchers to control for the effects of attention in future intervention studies so that the exact effects of exercise interventions can be accessed more accurately.

5.6. OUTCOMES FOR BMI

When discussing the outcomes for BMI it is important to be mindful that reducing weight status was never an aim of the study. The exercise therapy intervention aimed to empower obese adolescents to become habitual exercisers. As such, any conclusions drawn about the success of exercise therapy as a tool for reducing BMI must consider this first. There were no significant differences in BMI amongst the intervention and control groups, which is consistent with previous studies adopting a physical training intervention with overweight and obese girls (Nassis et al., 2005a). Findings here suggest that in the absence of weight loss, obese children randomised to exercise therapy still benefited from significant improvement in mental health outcomes. This contradicts evidence from previous camp-based studies (Barton, et al., 2004; Gately et al., 2000) where positive change in mental health were attributed to

concurrent reductions in weight. In comparison with other treatment programmes (Epstein et al., 1995; 2000; Israel et al., 1994) the intervention adopted here was relatively short. Whilst this might have facilitated adherence, a longer intervention might have been much more likely to have produced greater improvement to weight status. Furthermore, although the exercise therapy group reported increases in physical activity, these were only modest (4.8-5.8%) and might not have been sufficient in dose to significantly lower BMI. Also, there is the possibility that reported increases in physical activity were exaggerated and could have been compensated for by an increase in energy intake. Objective measures of physical activity such as the use of accelerometers might provide a more accurate assessment of physical activity habits in future studies. It is also reasonable to suggest that any weight lost was masked by an increase in fat free mass that is often accrued during the first few weeks of an exercise programme. Therefore, to address this issue it might be beneficial for future studies using an exercise protocol to assess the extent to which this change in body composition restricts weight loss per se. In terms of reducing the health hazards of obesity in paediatric populations, previous research suggests that it might be more important to improve cardio-respiratory fitness (CRF) as opposed to reducing weight status (Nassis, Psarra & Sidossis, 2004). Physical inactivity is recognised as a risk factor for coronary artery disease (Fletcher et al., 1996). However, regular aerobic physical activity increases exercise capacity and plays a role in both primary and secondary prevention of cardiovascular disease (Fletcher et al., 1996). Therefore, it appears more beneficial to be fitter rather than thinner (LaMonte, Eisenman, Adams, Shultz, Ainsworth, & Yanowitz, 2000). With this in mind, results from the assessment of physical fitness in the current study suggest that exercise therapy positively affected obese adolescent's cardio-respiratory fitness. Nassis and colleagues (2004) also

highlight the limitation in examining health complications of obesity by studying BMI alone and suggest trunk-adiposity; percent fat and CRF should also be used in clinical practice.

5.7. HOME PROGRAMME DISCUSSION

Due to the economic cost of the rise in obesity, finding sustainable and cost effective ways of helping children change behaviours is essential. Home programmes have the potential to be of some pragmatic value and are relatively low cost. This might be of particular importance in organisations that have limited funding for intervention studies such as the NHS. There is evidence from this study that home programme phases in behavioural trials might play an important role in maintaining healthy behaviours. Though previous trials (Epstein et al, 1985; 1995; Golan et al, 1998; Schwingshandl et al, 1999) have included a monitoring phase, (such as monthly meetings), the methodology and rationale for these programmes has been limited. Few studies report data on the nature of the meetings or monitoring processes particularly relating to and how they might have contributed to change. The aim of the home programme phase in this study was to empower the participant to take control of their own health and offer them an opportunity to employ the skills learned during the exercise therapy intervention in a real world setting. The results this was achieved in part, and the detailed methodology provided could help provide a template that future trials might adopt. The results demonstrated that the majority of home programme goals set by the exercise therapy group focused on physical activity, compared to nutrition. Although a dietary advice sheet was given to participants at the beginning of their participation in the trial, the focal point being physical activity reflects the nature of the exercise therapy intervention and corresponds to the skills/feelings of mastery the participants might have developed during the 8-week programme. Participants developed skills on how to use different modes of physical activity such as treadmills, bikes and rowing machines to the point where by the time the home programme begun they were able to programme the machines themselves and felt competent

on the techniques required to use such machines correctly. It is reasonable to suggest the skills resulting from the exercise therapy intervention combined with the current health messages concerning physical activity had a positive impact on the aspirations and expectancies of the participants. Physical activity goals were also more frequent than sporting goals. The most common goals focused on relatively non-skill based physical activity such as brisk walking and sit-ups rather than structured sport which has implications for curriculum design in that it could be more appropriate to offer children the opportunity to participate in physical activity, like walking or active play rather than specific, structured bouts of sports orientated exercise. This finding is supported by the Health Survey for England (2002), which found that the most common type of physical activity was active play (69% of boys and 60% of girls on at least 5 days) whereas participation in sports and exercise was markedly lower (16% of boys and 10% of girls participated on at least 5 days). There are a number of explanations for the reported difference between physical activity and sports orientated goals. Firstly, the latter part of the exercise counselling model focused on reinforcement management and self-liberation. A priority was identifying exercises that were easily accessible outside of the intervention environment, brisk walking and sit-ups being prime examples. Secondly, both aforementioned activities were integral to the exercise therapy intervention, thus it is possible participants shared confidence and feelings of mastery over these tasks. Thirdly, and perhaps most importantly, given that social-economic class is as cited as being important contributing factors to levels of obesity (DoH, 1999), these activities can be achieved with little monetary cost.

5.8. STRENGTHS AND LIMITATIONS

Whilst this study offers a novel approach to treating the psychopathology associated with childhood obesity and might have implications for future research programmes and health policies, the findings should be interpreted in light of several strengths and limitations. As participants were recruited from hospital referral and/or local media advertising, it could be

that they were unusually motivated and not representative of the obese adolescent population in general. The extent to which baseline motivation influenced the success of the intervention is difficult to determine, as this was not assessed. However, in light of the fact that the sample was predominantly sedentary, racially diverse and of lower socio-economic status, which is considered the most difficult population to access, this seems unlikely. Furthermore, this study's population is in contrast to the predominately white middle class, highly motivated individuals of previous research that is often criticised for its lack of strength in generalising results to wider populations (Summerbell et al., 2003).

Recruitment was positive with a high rate of eligible patients enrolled via paediatrician referral (48%). This shows that it is possible to recruit obese participants from children's hospitals and that exercise therapy might be an attractive option for those seeking treatment from the NHS. However, despite this and due to time constraints the trial was marginally underpowered (N=81 instead of N=90). Nevertheless, it is encouraging that a significant effect of the magnitude expected for the primary outcome of PSW was obtained. Furthermore, the sample size was larger, or at least equal in size, to most trials included in a recent Cochrane Library systematic review (Summerbell et al., 2003) and other more recent obesity treatment trials (Berkowitz, Wadden, Tershakovec & Cronquist, 2003). While we used the 98th percentile as our inclusion criteria for obesity (Cole et al., 1995) most participants had BMI scores above the 99.6th percentile providing data on a population who are often the most difficult to recruit. Studies that include morbidly obese adolescents are particularly useful in highlighting the progressive consequences of excessive weight gain during a critical phase of children's lives. It is unknown whether or not exercise therapy would provide similar or even larger effects in adolescents with lesser degrees of obesity and/or not seeking treatment. Interventions for the treatment of childhood obesity have often been limited by poor compliance and a lack of follow-up (Summerbell et al., 2003). To resolve this issue,

treatments not only need to be effective, but also be ones that obese adolescents are motivated enough to use. The adherence rates for the exercise therapy intervention and the exercise-placebo were excellent. This suggests that when provided with opportunities and support to do so; obese adolescents are willing to engage consistently in regular exercise. The low attrition across follow-ups (Figure 3.2) was particularly encouraging and perhaps reflects the growing desire for the development of feasible obesity treatments amongst society. Previous reviews (O’dea, 2006) have suggested that adherence to exercise interventions in obese populations is an especially important issue because involvement has potential to further sensitise participants about their weight status, therefore cause additional harm. This was not the case here as no lasting exacerbation of existing concerns regarding self-esteem or other components of psychopathology were recorded.

As has been discussed previously, the inclusion of the exercise-placebo is considered a significant methodological advancement on previous research. Furthermore, the same researcher delivered all intervention sessions. Whilst this made the trial very labour intensive (over 1400 hours of contact time) it is critical that future research seek to do the same. Previous studies that have examined lifestyle interventions involving obese children have failed to provide detailed information about the content of the exercise sessions (Stella et al., 2005). Not only are the methods adopted in this study described in detail (Daley, Copeland, Wright & Wales, 2005), but physiological data from both the exercise therapy and exercise-placebo groups were systematically collected in the form of HR throughout every intervention session so that aerobic output could be quantified and considered alongside possible effects. Without such information it is difficult to know what dose of exercise is likely to provide benefit. Although not considered to be a substantial limitation, because the questionnaires were self-administered, blinding of the assessments was not possible. With regard to the change in physical activity status, it is conceivable exercise therapy participants over-reported

the amount of physical activity they were achieving during follow-up. However, if this had been the case similar over-reporting would have been expected in the exercise-placebo group. The measurement of physical activity adopted in the study (PAC-A) did not provide information on intensity and duration of activity and only assessed physical activity during the school year. Future studies might wish to adopt a more comprehensive and/or objective measure of physical activity, but in doing so must be mindful of the additional time costs and expense of techniques such as accelerometry/determination of oxygen consumption. Due to multiple statistical testing it is important to recognise the possibility of type 1 errors and as a result outcome differences might be erroneous. Analyses also revealed a number of null results for outcomes included in this study but the consistent trend in psychopathology variables in favour of exercise therapy suggests that reported differences are real.

5.81. Home programme limitations

Concerns have been expressed over the ability of children to accurately recall and report physical activity patterns (Baranowski, 1988). The extent to which young people overestimate activity duration when self-report measures are used can be marked (Welk, Corbin, Dale, 2000) with studies suggesting that in comparison to heart rate monitoring, adolescents can overestimate moderate intensity physical activity duration by up to 40 per cent (Gilson et al., 2005). According to Baranowski (1988), to ensure validity and reliability of self-report scales measures must be taken to improve the cognitive processing of such data in children. In other words, children need to be given skills for accurate recall of their physical activity. The latter stages of the exercise therapy intervention attempted to provide participants with skills necessary to set appropriate goals and report their behaviour accurately. The home programme diaries support the success of this, in that days were left blank where no activity occurred. The use of objective assessments of exercise however, would corroborate and add further validity to the findings. The desire to provide others with a favourable impression of oneself (Demaio, 1984) could account for response biases in the home programme data. This

factor is particularly likely among adolescents, for whom some behaviour, such as athletic competence, is associated with status in certain settings (Brener, Billy, & Grady, 2003). The success of a home programme could also be determined by its duration. Research has shown that the accuracy of self-report changes over time (Rothman, Salovey, Antone, Keough, & Drake, 1993). For example, reported behaviours over a year, as in previous research (Epstein et. al, 1984; 1985) are generally less accurate than those reported for the previous month (Rothman et. al, 1993). Further studies are needed with the obese adolescent population to determine the strength of the findings reported for the home programme phase of the study and objective measures such as the use of accelerometers might prove valuable.

5.9. CONCLUSIONS

Although treatment effects were modest, evidence here suggests that participation in a supervised exercise therapy intervention can significantly improve measures of self-esteem and increased physical activity in obese/morbidly obese adolescents over time, relative to usual-care. The significant improvement of exercise therapy compared to the usual care arm of this study demonstrates that the psychological needs of obese adolescents are unlikely to be met fully by standard care currently offered by clinicians or health professionals. Instead supervised exercise therapy interventions appear to be of some benefit to psychological health. Whilst somewhat labour intensive the RCT format of this study could be refined to offer a cost-effective alternative to more common psychological treatments, (e.g. cognitive behavioural therapy) making it a serious option in the management of childhood obesity. Furthermore, results here have implications for the global treatment of obesity. Exercise therapy has the potential to reach a broad audience as indicated by the socio-economic diverse sample found here, who might not be able to, or choose not to, access other types of psychological interventions. As such, there is much too commended further investigation of the efficacy of exercise therapy in the treatment of obesity in other populations such as adults.

A consistent critique of previous treatment interventions has been the extensive length and high intensity of exercise bouts (LeMura & Maziekas, 2003). Given previous positive exercise experiences are seen as central to an individual's future behaviour (Bandura, 1986) providing obese children, who have limited aerobic capabilities and lack physical self-competence (Okley et al., 2001) with positive physical activity experiences seems important to promote long-term exercise adherence. Therefore, future childhood obesity treatment interventions might benefit from concentrating interventions on developing mastery and providing a positive exercise experience for obese individuals before employing exercise or physical activity as a method of weight control.

Previously, much attention has been given to obese individual's physical health status without due concern for other aspects of their well-being. It is hoped that results from this study will help to generate additional interest and concern about the psychopathology of young people who are obese and raise awareness of the importance of assessing the efficacy of obesity treatments in relation to psychopathology outcomes, and not exclusively in terms of weight loss. Ultimately, it is essential that simple and cost-effective strategies be offered to obese adolescents as part of their rehabilitation process so that they are able to participate in society to the same extent as their non-obese counterparts.

6.0. SEMI- STRUCTURED INTERVIEWS

6.1. INTRODUCTION

Whilst quantitative methods enable accurate analysis of an intervention, they are limited to characteristics considered important by the investigators (Jolly, Greenfield & Hare, 2004). Well-being and health are personal entities and 'value' cannot be seen only in terms of quantifiable outcomes. Instead, methods such as qualitative analysis, potentially offer an improved and complementary approach for eliciting an individual's perspective on treatment (Jolly et al., 2004). Interventions using exercise and physical activity to address some of the health consequences of obesity have been evaluated, but have yielded limited success (Summerbell et al., 2003). Therefore, there is a need to further understand participants' experiences during obesity treatment trials to determine the factors likely to improve attendance, adherence and treatment success in subsequent investigations. The inclusion of a qualitative dimension to this thesis might also further understanding of health professionals' about the exercise needs of obese adolescents, so that they can be better served in the future. The following chapter (comprising of two qualitative studies, the eight-week interviews and 14-week interviews, nested within the main randomised controlled trial) reports the individual views and experiences of those who were randomised to the exercise therapy arm of the trial.

6.2. METHODS

In line with a purposive sampling procedure (Patton, 1990) all participants who had been randomised to exercise therapy, including those that had high and low adherence, males and females and younger and older participants were invited to complete a semi-structured interview at the end of the intervention (here referred to as eight-week interview) and again post home programme (here referred to as 14-week interview. Table 6.1 describes the characteristics of interviewed participants on commencing the intervention.

Table 6.1. Characteristics of interviewed participants on commencing the intervention

Participant number	Gender	Age	Ethnicity	Adherence (range 1-24)	Obesity status ¹ (BMI SDS)	BMI (kg/m ²).	Interview at 14-weeks	IMD Rank Score ²
P1	Male	15	White	22	Morbidly Obese	37.60	No	1
P2	Female	16	White	20	Obese	35.26	Yes	4
P3	Male	14	White	22	Obese	31.28	No	4
P4	Female	16	White	23	Obese	38.59	No	2
P5	Female	13	White	24	Obese	29.18	No	4
P6	Female	15	White	24	Obese	35.07	Yes	2
P7	Female	14	White	20	Obese	37.23	Yes	1
P8	Female	14	White	22	Obese	31.46	Yes	4
P9	Female	13	White	24	Obese	30.43	Yes	4
P10	Female	11	White	24	Obese	33.15	No	4
P11	Female	14	White	24	Obese	37.25	Yes	1
P12	Male	12	White	22	Morbidly Obese	35.73	Yes	1
P13	Male	11	White	22	Obese	28.44	No	4
P14	Female	11	White	21	Morbidly Obese	42.57	Yes	4
P15	Male	13	White	24	Obese	30.83	Yes	3
P16	Female	11	Black	22	Obese	28.48	No	4
P17	Male	13	South Asian	24	Obese	29.54	Yes	2
P18	Male	14	White	21	Morbidly Obese	37.97	Yes	4
P19	Female	11	White	19	Obese	29.46	No	1
P20	Female	12	White	17	Obese	28.45	Yes	4
P21	Male	12	White	21	Obese	32.65	Yes	4
P22	Female	11	White	24	Obese	31.50	Yes	3
P23	Female	11	White	17	Obese	31.45	No	1
P24	Female	15	White	24	Obese	37.71	No	3
P25	Male	14	White	22	Obese	33.05	Yes	4

¹Obesity status calculated according to SD scores (Z scores) relative to current UK standards

BMI SDS ≥ 3.5 =morbidly obese.

²Index of multiple deprivation (IMD) quartiles: 1=least deprived and 4=most deprived.

An “a priori” semi-structured interview schedule was used to standardise the eight-week interview (Appendix 9) and the 14-week interview (Appendix 10). Each interview lasted between 15-25 minutes and was conducted on a one to one basis with one of two members of the investigative team in English. The semi-structured interview schedule employed was designed in line with various qualitative methods texts (Brenner, Brown & Canter, 1985; Taylor & Borgdan, 1984). All the interviews were tape-recorded and transcribed verbatim. The generated interview data in part reflected the direction and focus of the semi-structured interview schedule, but there was sufficient flexibility to allow participants to express their experiences of the intervention, in whatever order they wished.

The data collection process followed a framework analysis which offered a deductive approach from pre-set aims and objectives (Pope, Ziebland & Mays, 2000). In this instance the analytical process of the data was strongly informed by 'a priori' reasoning. Immersion in the raw data was conducted with the same two members of the investigative team independently reading and re-reading all the transcripts. The same two researchers also listened to each taped interview to gain additional insight that the printed word cannot provide, such as tone of voice and pauses. A thematic framework identifying all key issues, concepts and themes from the raw data was established, with analysis conducted between and within the transcripts. A detailed index of the data was developed, which labelled the data into sections using a cut and paste method. These sections were then explored, compared and discussed between the same two members of the research team with a view to providing explanations for the findings. The process of mapping and interpretation was influenced by the original research objectives as well as by the themes that emerged from the raw data. The following chapter will report and discuss outcomes from each interview schedule separately. Example transcripts for the eight-week (Appendix 11) and 14-week interviews (Appendix 12) are presented in the appendices.

6.3. EIGHT-WEEK INTERVIEW SCHEDULE

Of those randomised to exercise therapy (N=28), 25 consented to be interviewed and 23 provided useable information. The sample consisted of nine male and 16 female obese adolescents (BMI Centile > 98th UK standard) with a mean age of 13.0 (SD 1.7) years. At eight-week interview, the semi-structured interview schedule was used to discuss the following issues: Reasons for becoming involved in the study; sources of motivation to attend exercise therapy sessions; experiences of participation in exercise therapy intervention; views about the structure/usefulness of the intervention; potential barriers to exercise; body consciousness; physical self perceptions and self perceptions; beliefs about the role and usefulness of exercise for improving health; and lessons learnt from participating in the exercise therapy intervention

6.4. RESULTS: EIGHT-WEEK INTERVIEW

Presented quotes (Figure 6.1) reflect the range of themes that emerged from the eight-week interview data and were typical of the insights that participants gave during their interviews.

6.41. Reasons for becoming involved with the project

The most frequently (N = 12) cited reason for initially becoming involved with the project was the influence of a significant other (parent or paediatrician). The desire to loose weight was also common (N = 8) with ill health avoidance cited twice. Two participants said they had no specific reason for entering the project. Only one participant stated that the decision to become involved with the project was their own idea.

6.42. Sources of motivation to attend exercise therapy sessions

Several participants (N=7) commented they were motivated to participate for intrinsic reasons such as fun and enjoyment (N=14) and/or self-improvement (N=3).

Figure 6.1. Participant responses from eight-week interviews

Reasons for becoming involved in the study

People just sit at home eating pizza all time; I wouldn't like to be one those boring people. I want to be a person that can go out, go on holiday, go to work, have lots of friends. (male P3)

My mum didn't know about it at first.... I did actually do it on my own bat (female P9).

Because I'd like to lose some weight (female P16).

I think it was through the hospital, Yeah, they mentioned it to us (female P7).

I thought it would be fun and it has (female P22).

Sources of motivation to attend exercise therapy sessions

Because I'd like to lose some weight (female P16)

Because I like doing it and I want to get the weight down, I'm determined (male P15)

I could see the benefits, like my heart rate going down, things like that, it was good to know that it was making me more healthy and I enjoyed it really (female P4)

I knew I was overweight so I thought I'd give it a try (male P12)

Attitudes and experiences of participation in exercise therapy intervention

They helped me to loose weight - that's what I am here for (female P9)

I am a bit more fit now, like healthier because I know how much I am meant to exercise now (female P8)

Because I wanted to do it (female P19)

I could see the benefits, like my heart rate going down (female P4)

It made me feel better about myself (male P18)

I felt healthier and better and stuff and I felt like I had actually done something. Rather than going home and being a couch potato (male P1)

It gets you out of the house and not eating, and also exercise helps you and it can help you loose weight (female P4)

Views about the structure/usefulness of the intervention

It was fun, you had time to exercise and time to have a break in between, so I wasn't tired (male P15)

I'd come over, have a rest, have a drink and then, when we were going for, like, another one, I just relaxed a bit and I just went on to it [exercise equipment], but I didn't feel right tired when I got back on to on [exercise equipment] (female P10)

It was alright, cos if it had gone on longer then I think that wouldn't have been able to do everything properly (female P7)

Make it longer so more weeks (female P16)
Potential barriers to exercise

It's not opportunity. I probably could, somehow, fit it in, but it's just, I really can't be bothered. I want to, but, actually, I don't at the same time. It's like, I must go the gym, and then I don't bother (female P2)

I might just want to do something else (male P25)

School work, family commitments and friend commitments, if my friends need me I will be there for them (male P1)

Coming from school really, that was the only thing I found difficult. I was tired, but I thought I'm still going (female P6)

Body consciousness, physical self perceptions and self perceptions.

I just feel more confident comfortable and confident (male P1)

That you can achieve anything and there's no reason to doubt yourself, what your doing and who you are, it makes you like stand up for yourself, if people pick on you, you just give them something back (male P3).

That I can do things. I feel a lot happier I'm doing something (male P18)

That I can do a lot more, I'm capable of a lot more than I thought I was (female P7)

I feel better because I've done something, I know I can help myself more now
Like, I feel like I've lost weight (female P10)

It feels like, it's just like I've lost some weight, and it feels like I've just let go of myself and come here and lost some weight (female P5)

I feel as if it's definitely changing shape for the better, and I just feel a lot more confident (female P6)

Beliefs about the role and usefulness of exercise for improving health

They helped me to loose weight - that's what I am here for (female P9)

I am a bit more fit now, like healthier because I know how much I am meant to exercise now (female P8)

Well I mean I know you don't eat cake! Well you can eat cake, just in moderation (female P9)

It got me to understand that exercise is something you need to do, it is not something you can just throw off or make up (male P3)

I felt healthier and better and stuff and I felt like I had actually done something. Rather than going home and being a couch potato (male P1)

It gets you out of the house and not eating, and also exercise helps you and it can help you loose weight (female P4)

Because we shouldn't have that many obese kids in this world because when they're older they'll get really really fat (female P16)

Yeah, cos it makes you look at it a different way to what you used to, cos some kids just think "Oh well it will go away" (female P7)

Lessons learnt from participating in the exercise therapy intervention

That you can achieve anything and there's no reason to doubt yourself, what your doing and who you are, it makes you like stand up for yourself, if people pick on you, you just give them something back (male P3)

That I can do it if I keep trying (female P16)

some people aren't motivated to get exercise and this motivates you (female P11)

That I can actually exercise if I want to (female P6)

I've learnt how to do exercise, how to eat properly (female P10)

That I can do a lot more, I'm capable of a lot more than I thought I was (female 7)

Teachers have noticed a lot of difference in PE. I am more willing to keep going (female P9)

That I am fitter than I thought I was, but I'm not as fit as I'd like to be (male P15)

That I can do the exercise, I've just got to make sure I fit it in (female P4)

Five participants mentioned improving health as the primary source of motivation for attending the exercise intervention and six participants believed having good health was desirable. Related to this, four participants reported the fear of health consequences was an important source of motivation for attending the exercise intervention. Weight loss was reported in 11 participants as an important source of motivation for participating in the trial. Expressions of mastery of exercise skills were frequent (N = 19) and a large number of the sample (N = 12) expressed that they looked forward to attending the exercise therapy sessions. There was also evidence that the intervention became part of the participants' weekly routine (N = 6).

6.43. Attitudes and experiences of participation in exercise therapy intervention

Overall participants were very positive about the exercise therapy intervention; sixteen participants expressed that the exercise therapy intervention was fun and enjoyable (N = 16) and in particular using the aerobic exercise equipment (N=9). Participants admitted to liking the inclusion of non-exercise activities such as the pool table (N = 6), table tennis (N = 5) and gym balls (N = 3) and seven said that the intervention had motivated them to make a positive behaviour change. Six participants commented that they felt the content of the sessions was achievable, whilst still remaining challenging. Several participants (N=7) expressed the view that they had gained a sense of personal progression from participation. Three reported that the sessions had provided them with a sense of motivation to exercise, which had not been experienced previously. Although most participants reported enjoying the intervention, several participants (N=4) also made negative comments. These tended to be related to using specific pieces of exercise equipment in the exercise therapy room. One participant thought that exercise was boring.

6.44. Views about the structure/usefulness of the intervention

Participants strongly emphasised the value of the intermittent exercise structure and many participants indicated (N=10) that this approach was acceptable and achievable, mainly because it provided the opportunity to have a rest, cool down and get a drink. The most common complaint (N=5) was that the intervention period of eight weeks was not long enough. In general, the role of exercise for improving health was looked upon positively, mainly because it was seen as an effective method of weight management. Seven participants felt they were more aware of the role of exercise for improving and maintaining their health. While participants were questioned specifically about the usefulness of exercise in terms of their general health, rather than weight loss per se, many provided answers in terms of losing weight, with eleven participants reporting the intervention had helped them to consider their diet and the types of foods they were consuming. Only two participants commented on the link between obesity in childhood and health consequences in later life.

6.45. Potential barriers to exercise

A wide range of exercise barriers were cited by participants, these included: the weather (N=3), getting tired or out of breath (N=5), difficulties with exercising after school (N=1), feeling tired (N=4), lack of time due to school/schoolwork (N=4), commitments to family/friends (N=3), feeling lazy/unmotivated (N=4).

6.46. Body consciousness, physical self perceptions and self perceptions

When asked to reflect on how they felt about their bodies after completing the exercise intervention, the dominant theme centred on weight loss and body shape (N=8). Taking this point further, several participants (N=11) commented that they felt they had lost weight and they subsequently associated this with other types of positive feelings and responses, such as feeling more energetic (N=3), not feeling lazy or like a slob (N=2) and feeling healthier/fitter (N=3). Participants also reported that they felt their body shape had changed as a result of the

intervention (N=7). Participants expressed they felt confident with regard to exercise and moreover were aware of how much exercise was required to maintain and improve their health (N=18). Expressions of improved physical self perceptions (N=10) global self-worth (N=8), global self confidence (N=9) and athletic competence (N=12) were common. There was a general sense that participants were happier than when they began the programme and that they felt empowered to continue to exercise over the long-term (N = 7). There were numerous expressions regarding positive weight loss (N=11), changes in physical fitness (N=15) and changes in body shape (N=7).

6.47. Beliefs about the role and usefulness of exercise for improving health

Participants conveyed an understanding (N=19) that the exercise therapy sessions were of benefit to their health. There was an association made between the exercise sessions and weight loss in a number of participants (N=6). There was some evidence of progression, with participants reflecting on their previous levels of fatigue associated with exercise compared to how they feel now (N=10). Some participants expressed that the intervention had made a definite difference to the way they feel about themselves (N=12). There was evidence of positive self talk (N=16), re-enforcing statements (N=8) and task specific self-efficacy (N=19).

6.48. Lessons learned from participating in exercise therapy intervention

When participants were asked to reflect on their involvement in the intervention and to think about what they had learnt (if anything) from their experiences, participants (N=9) commented that they had previously underestimated their ability regarding exercise, and were pleasantly surprised at how much exercise they could achieve under guidance; there was a strong sense of realisation of being capable of achieving more in terms of regular involvement in exercise. Nine participants specifically commented that they 'felt better' or more confident about themselves generally.

6.5. RESULTS: 14-WEEK INTERVIEW (HOME PROGRAMME PHASE)

6.51. Sample characteristics.

Of the 23 adolescents who completed the eight-week interview, 15 completed the post home programme interview. This was due to lack of interviewer provision and not as a result of participant drop-out. The sample consisted of 80% (N=12) obese (BMI >2.5 SDS, adult equivalent BMI of ≥ 30) and 20% (N=3) morbidly obese (BMI >3.5 SDS, adult equivalent BMI of ≥ 40) individuals, consisting predominately of White children, 93% (N=13), with a further 7% (N=1) of South Asian ethnicity. At 14-week interview, the semi-structured interview schedule was used to discuss the following issues: Initiating and maintaining behaviour change; attitudes and barriers to exercise; exercising independently; the exercise diary intervention; body consciousness; physical self-perceptions and self-perceptions; and lessons learnt from participating in the study as a whole. Presented quotes (Figure 6.2) reflect the range of themes that emerged from the 14-week interview data and were typical of the insights that participants gave during their interviews.

6.52. Initiating and maintaining behaviour change

A large proportion of participants (N=12) responded positively with regard to their exercise experiences during the home programme phase of the study. Of those that completed the 14-week interview, four stated that they had maintained their current exercise behaviour and nine had increased their participation in exercise. One participant reported that they had initiated new exercise behaviours but indicated that these were not maintained and cited a lack of support as the reason for this. In response to the question 'do you think you will be able to keep your exercise participation up' 71% (N=10) of participants responded positively. Interview responses from four participants provided evidence that exercise had become part of daily living with a further five indicating that they planned to carry on exercising over the longer term. Only three said that they had failed to maintain some form of physical activity.

Figure 6.2. Participant responses from 14-week interviews

Initiating and maintaining behaviour change

I've started going swimming three times a week before school....mum and I started that when I finished here, I've benefited from it, so I think I may as well if it's going to help me, I may as well do it. I've got used to doing it a lot more, cos before I didn't do much. but now because I've started doing it, it's a routine (female P7)

I've been going to the gym at school, I've been to the table tennis club and I've been doing some sports like basketball and football at school..... Yeah, I think Yeah; I think it's going to be a long-term thing. I'm going to try and stick with it (male P12)

Gym and swimming- I've been on the treadmill and on the bikes and on the skiing machine, I've basically gone through most of them. I've been doing walking and, sit-ups..... Yeah definitely, now I'll be getting more money it means that I can go swimming more often and things like that (female P6).

I think I'll do it a month at a time (male P18).

Attitudes and barriers to exercise

I enjoy it more now, because I know it's helping me, but before I wasn't that bothered, but now I've started to do something and it's helping me, so I like doing it more rather than not bothering to do it (female P7)

the satisfaction that i know its going to help me, but i don't enjoy the sweating (male P15)

The feeling afterwards mainly, you feel a lot better about yourself and if you haven't done any you feel like you've got nothing done (female P6)

It just tires you out a bit (male P12)

I don't like it at the minute 'cos it's cold. Going outdoors, I don't like that. I think it is definitely summer, it's easy in the summer to get out and do stuff (female P2)

i don't really know, i can't think of anything (male P15)

the weather and if it's? after school (female P14)

coursework, homework maybe (male P25)

Exercising independently

I've been ok it's been ok, it's easier with rob (researcher) because he told you what to do (male P25).

When I go swimming, it's with my mum, so I'm with somebody each time I do something. and when I'm at school, it's in a group, so I'm not on my own (female P7)

I like doing it on my own (male P21)

It's a bit harder. ... I can do it on my own but its just remembering to do them all (female P20)

The exercise diary intervention

Bit of a pain, yeah, it's like having to fill it out every day (male P12)

It was good because it showed me what I had actually been doing. I did look back and it had done a lot more than what I thought I had. It just showed me what I could do and what I was capable of doing (female P6)

I haven't used it. because I lost it (male P18)

I could remember what I'd done (female P20).

A bit of a pain. I missed out a week (male P21).

Body consciousness, physical self perceptions and self perceptions.

That you can loose weight if you want to and just keep doing it (female P8)

I am fitter than I actually thought, and I can be a lot fitter. I don't have to stop as often when I'm doing exercise no.....how does that make you feel? Brilliant. (male P15)

I've got more friends now...and you think that's the result of the exercise do you? Yes (male P21)

That I can do it, it's just pulling your finger out It isn't as hard as I thought it was, 'cos I did, like, really enjoy it (female P2)

like before, I just thought "oh well I'm just overweight, I can't do anything about it", but now because I've started exercising and eating differently, then I've thought "well I can change", you know (female P7)

A lot better about myself, you know it makes me confident, pushing yourself further each time and stuff like that. (female P6)

I feel different because I can do things that I wasn't able to do before.(female P14)

I feel I've done something to help myself Yeah, achieved something (male P17)

I've enjoyed all of it, it was fun doing all the exercises and everything, it wasn't ever boring like "oh I've got to go there today", I just used to go "oh, I like to go", cos otherwise I'd just be sat at home doing nothing, so I've enjoyed it. (female P7)

It showed me that I really do need to exercise. Making sure that I had breakfast because a lot of the time I would just skip it, because I didn't have time or because I wasn't feeling like it in the morning. But I've made sure that I have had it and that is it healthy during the day, I've not felt as hungry. I would probably have not exercised it something that I have always thought, I'll just diet instead. It worked out a lot better (female P6)

it was really fun (male P15)

At first it was like, I wasn't too keen on doing it, I have always thought exercise was too hard, but once I came and they said to us about it and things like that I was definitely wanting to do it then. I'm glad I did it. (female P24)

Yes, been very informative (male P25)

I feel like I've lost a little bit of weight and it feels good (female P23)

Yes. It helps to get your heart fit. (male P18)

yeah I wasn't able to before, but now I can (female P14)

6.53. Attitudes and barriers towards exercise

Participants commented that they enjoyed exercise (N=10) with one individual citing the competitive element of games and sport as a positive. Six participants said that they exercised because they knew that it was of some benefit to their health. One participant said that they exercise because it made them feel better about themselves. Getting sweaty (N=2), feeling tired (N=4) lack of motivation (N=2) and feeling breathless (N=2) were cited as the main barriers or negatives of exercising. The weather (N=2), course-work (N=3) and lack of time (N=3) were also cited as barriers to exercise. Four participants said that nothing stopped them from exercising and a further three said that they could not think of any negative things to say about exercise.

6.54. Exercising independently

Responses regarding exercising independently were mixed. Five participants suggested that it had been more difficult to exercise on their own; whereas six suggested that it was either "OK" or responded "No" to the question 'has it been difficult to exercise on your own without the support of the researcher?' One participant said that they had received support from a family member to help them with their exercise. One participant expressed a preference for exercising on their own.

6.55. The home programme: exercise diary intervention

Views about the exercise diary were mixed particularly regarding its use in maintaining exercise participation. Seven participants suggested that filling out the exercise diary had been a positive and useful experience, suggesting that it had helped them remember their achievements over the home programme period. Two participants said that the exercise diary had shown them what they were actually capable of doing regarding exercise. One participant indicated that they had found it useful as a tool to identify reasons for failing to exercise. Five responded negatively towards the exercise diary citing that they had found it of little use

(N=2) or of no use to them at all (N=1). One participant said that they had lost the diary and three suggested that filling it out was difficult and labour intensive. One participant referred to the fact that other people (parents in particular) might think it to be of use, but actually they viewed it as disheartening and reminded them of actually how little physical activity they did.

6.56. Physical self perceptions and self perceptions

Responses to the question 'how do you feel about your body now that you have been involved with the project for some time' were positive across all participants. Participants (N=10) suggested that that had either lost weight or perceived themselves to be thinner and /or fitter as a result of being involved with the project. There was evidence that participants felt more confident about their bodies (N=4), felt healthier (N=7), were greater involved in friendship groups (N=1) and expressed certainty that they could change (N=2). However, three participants said that they still worried about their weight. All of the participants (N=14) interviewed at 14-weeks made some inference to how surprised they were at what they had been able to achieve during the programme and made comment that 'they could do it if they tried'.

6.57. Attitudes and experiences of the study as a whole

All participants (N=14) indicated that the project had been fun, enjoyable and a worthwhile experience. Nine of the participants indicated that children who had weight concerns should be encouraged to become involved in similar projects. Four participants indicated that the project had had a positive impact on their diet. There was also support for benefits of a adopting a healthy lifestyle that included regular exercise. None of the participants commented negatively towards the programme although three suggested that they would have liked it to be of longer duration.

6.6. DISCUSSION

These two qualitative studies, nested within the main randomised control trial, explored obese adolescents' experiences of participation in an exercise therapy intervention and subsequent home programme follow-up. To inform future childhood obesity treatment, it is important to understand why obese individuals participate in and adhere to treatment programmes. The semi-structured interviews presented here offer insight into the experiences of obese adolescents during exercise therapy sessions and then as they try to establish exercise habits independent of specialist support. The following discussion constitutes three parts. Firstly, a discussion of the outcomes from the eight-week interviews (first qualitative study), secondly, consideration of the implications of the 14-week interviews (second qualitative study) and thirdly a brief review of the semi-structured interviews as a whole with appropriate summary.

6.7. DISCUSSION OF THE EIGHT WEEK INTERVIEWS:

6.7.1. Participant perspective of exercise therapy

Comments from the eight-week semi-structured interviews suggest that the experiences of obese adolescents attending a structured exercise therapy intervention positively influenced dimensions of psychopathology lending support for the quantitative trial findings, past non-randomised research (Barton et al., 2004; Gately et al., 2000; Walker et al., 2003) and related reviews (Ekeland et al., 2005). Participants reported being - '*happier*' after exercise suggesting the intervention had had a positive impact upon their domain specific and global self-esteem, which are also consistent with the main trial results - *I feel pleased that I've actually done it. It's like "yeah", I've done it.* Findings concur with those of previous studies in supporting a positive association between exercise participation and psychological well-being in healthy adults (Eriksen & Bruusgaard, 2004) and obese young people (Stephoe & Butler, 1996). Furthermore, as with other studies (Barton et al., 2004) results here demonstrate that confidence in one's ability to be physically active is an important

determinant of physical activity in children and adolescents. In obese young people, serious forms of psychopathology are likely to be linked to negative physical self-perceptions, self-perceptions and perceived body image (Butler, Hokanson & Flynn, 1994). Exercise therapy might have a facilitative role in helping to reverse these trends by providing participants with positive cues towards a sense of achievement regarding their physical self - *I could see the benefits, like my heart rate going down, things like that, it was good to know that it was making me more healthy and I enjoyed it really.* It is likely that this change in domain specific self-esteem could also positively affect psychopathology. As in previous studies (Okley et al., 2001), the main trial baseline results suggested that obese adolescents experience poor perceived physical competence and report low efficacy expectations, which are likely to have stemmed from negative past exercise experiences and/or a distinct lack of opportunity to exercise in the first instance - *When I first came it was a little bit hard for me because I didn't know what to do.* However, comments from the eight-week interviews indicated that continued participation in the exercise therapy intervention was associated with positive change in physical self-competence - *I can run and that now before I couldn't - When I first came it was a little bit hard for me because I didn't know what to do, but it's getting easier and I quite like the bike, it's quite good and I like the treadmill as well.* This suggests that obese children can successfully participate in structured exercise given the opportunity and support and that physical activity can contribute to the enhancement of their psychological and social well being, similar to other populations (Biddle, Sallis & Cavill, 1998; Mutrie & Biddle, 1995). This is fundamental as it seems unlikely that obese adolescents will engage in sufficient amounts of regular exercise unless they have had opportunities to experience some sense of efficacy from participation. This could be due to the social exclusion that tends to surround obese children (Israel & Ivanova, 2002; Zeller et al., 2004).

6.72. The importance of enjoyment for exercise participation

Participants consistently expressed that the exercise therapy sessions were fun and enjoyable. Enjoyment of exercise has been consistently associated with promoting exercise motivation and compliance in children (Dishman et al., 2005; Taylor et al., 1999) and is associated with long-term adherence in studies of young adults (de Andrade Bastos, Salguero, Gonzalez-Boto & Marquez, 2006). The theme of enjoyment has also been shown to be an important element in programme adherence during weight-loss camps (Holt, Bewick & Gately, 2004).

Conversely, forcing a child into un-enjoyable exercise can have negative consequences for later adult activity (Taylor, Blair, Cummings, Wun, & Malina, 1999). Where possible, interventions should involve children in physical activities that they enjoy, to facilitate feelings of esteem and promote social interactions and friendships (Strauss & Pollack, 2003). Interview comments suggest that exercise therapy as an approach was successful in achieving this - *It made me feel better about myself*. Comments reflecting change in self-esteem through positive exercise experiences are clearly encouraging as this was the primary aim of the intervention.

Participant views of the exercise therapy sessions also reinforce the assertion that programmes designed to treat obesity in children and adolescents should be built on skill-based instruction (Gately et al., 2000; Gately & Cooke 2003). Participants recognised the importance of choice, and commented favourably on the exercise therapy sessions offering a range of activities.

Activity choices have previously been shown to increase exercise motivation in obese adolescents (Ferrer-Caja & Weiss, 2000; Holt et al., 2005) so views in support of this approach are encouraging. The exercise therapy sessions were designed to take place on a one-to-one basis with a researcher who provided non-competitive, supportive, yet physically challenging exercise sessions and this might also have promoted enjoyment and adherence. It is also possible that enjoyment had an indirect influence on physical activity participation, by

enhancing self-efficacy through affective states. According to Bandura (1997) affective responses are sources of information about self-efficacy and therefore affective responses related to the enjoyment of physical activity could in part determine self-efficacy. This mediated effect of self-efficacy on changes in physical activity behaviour has been evidenced among older adults (McAuley, Jerome, Elavsky, Marquez & Ramsey, 2003) and more recently amongst adolescent girls (Dishman et al., 2005). On the basis of this, interventions adopting physical activity as an approach to treating obesity should ensure participants derive enjoyment from physical activity.

6.73. The structure of the exercise therapy intervention

The exercise therapy sessions aimed to provide participants with a positive experience of exercise. Offering activities that are enjoyable but also achievable for the participants is central to this. Many felt the intermittent exercise structure helped them to perceive regular exercise participation as an activity that was attainable - *It was fun, you had time to exercise and time to have a break in between, so I wasn't tired*, contributing to positive affective responses and increases in efficacy. This is critical because obese children and adolescents generally have limited exercise tolerance (Reilly, 2006). Thus, short bouts of exercise are likely to be more enjoyable and sustainable and provide a way in which to build efficacy and foster feelings of success. Using this approach, participants commonly extended a sense of surprise at how much exercise they were able to participate in - *That I can actually exercise if I want to; - That I can do a lot more, I'm capable of a lot more than I thought I was* and furthermore, several participants felt the intervention period of eight weeks was too short suggesting that longer interventions might prove to be even more efficacious. Findings also indicate that in an appropriate environment with support to do so, obese adolescents can be motivated enough to engage in and experience a positive change in their global self-esteem, through regular exercise. This is an important consideration when designing intervention programmes for obese adolescents since they can often be found to have had poor exercise

and sport experiences in the past (ACSM, 2000). Furthermore, many obese young people find it difficult to be active within their social networks or the school system due to lack of opportunity and the stigma associated with obesity and weight teasing means many avoid being active (Cameron, 1999).

6.74. Beliefs about the role and usefulness of participating in exercise

Physical activity in adolescence contributes to the development of healthy adult lifestyles, helping reduce chronic disease incidence (Hallal, Victoria, Azevedo & Wells, 2006). Heitzler and colleagues (2006) suggest that messages and interventions aiming to increase children and adolescent's participation in physical activity should focus on promoting the benefits that are associated with being active. With this in mind, it is encouraging that there was a sense from participants' interview comments that they felt more informed and aware of what they needed to do regarding physical activity and the benefits of living a healthy lifestyle. Findings are optimistic given that physical activity habits developed early in life may continue into adulthood (Telama, Yang, Viikari, Valimaki, Wanne & Raitakari, 2005), with regular participation in physical activity during childhood and adolescence of critical importance in the prevention of chronic disease later in life (Heitzler, Martin, Duke & Huluman, 2006). Interestingly, despite the strong focus of the intervention on exercise behaviour change and active living, as opposed to weight loss, many participant's responses to the question of the usefulness of the exercise intervention were related to weight loss and body shape. An explanation for this could be that weight management and appearance issues become of great consequence at, or around puberty (Wardle, Waller & Fox, 2002). This is due to biological and associated social changes occurring at this time that has the effect of increasing the importance of physical appearance for peer acceptance and social status (Smith, 2002). This could be a particularly difficult period for obese adolescents as early onset of obesity increases the risk of body dissatisfaction, which in turn impairs self-esteem (Wardle et al., 2002). Programmes focused on weight loss can exacerbate frustration and distress to obese

young people (Murtagh, Dixey & Rudolph, 2006), it appears even more essential for future studies to encourage the adoption of active lifestyles as the main aim for obese youngsters. Moreover, simply providing the relevant health information is insufficient to induce behavioural change (Murtagh et al., 2006) and instead researchers should adopt protocols that engage the obese child on a personal level.

Participants also presented views that showed understanding of the value of appropriate food consumption - *Well I mean I know you don't eat cake! Well you can eat cake, just in moderation.* Other research has shown that when individuals report they are trying to lose weight, they are more likely to change their diet, rather than their physical activity behaviour (Janssen, Craig, Boyce, 2004). However, negative experiences of dieting and of dieticians have been identified as barriers to changing unhealthy behaviours in obese children (Murtagh, 2006). Furthermore, Murtagh and colleagues (2006) reported that most participants in their study attributed unsuccessful weight-loss regimens to unrealistically strict dietary guidelines. Therefore, future studies might wish to promote the importance of healthy food choices rather than prescriptive diets that appear unrealistic. In spite of evidence suggesting that obese children only view weight loss as achievable through changes to diet, interview comments support evidence from a recent study (Borra et al., 2002) that obese and overweight teenagers, who want to loose weight, potentially view increasing physical activity as a more effective way of achieving this - *It gets you out of the house and not eating, and also exercise helps you and it can help you loose weight.* Further research that examines the contradictory nature of these studies is clearly warranted.

6.75. Barriers to exercise

Many of the common barriers to exercise typically reported by other young people were cited at interview (Foreyt & Goodrick, 1995; Gyurcsik et al., 2006). Participants clearly enjoyed the exercise therapy sessions with the competitive element of games and sport viewed as a

positive element of the programme. The skill-based nature of activities within obesity treatment programmes has received support from camp-based studies (Holt et al., 2005) and proved popular with participants here. Unlike previous studies with adolescents (Tappe, Duda & Ehrnwald, 1990) there was no evidence that body consciousness was as a barrier to participation, which could be due to the one-to-one nature of the intervention. Participants were not required to exercise as part of a large group or in front of normal weight peers. However, there is contradictory evidence from non-randomised camp-based studies indicating that obese children enjoy group activities from which they can gain sources of peer support (Holt et al., 2005). In light of this, an explanation for our findings could be that the exercise counselling included discussions about barriers to exercise that included issues surrounding body consciousness. It could be that this approach helped participants to find potential solutions to exercise barriers. The reported high adherence to the trial protocol would seem to substantiate this claim.

6.76. Perceptions of change in body composition on exercise participation

Previous research studies have often determined intervention success in terms of change in BMI (Epstein et al., 1995; Flodmark et al., 1993). Further, camp-based studies (Walker et al., 2003) have reported that change in BMIs was significantly correlated with increases in domain specific self-esteem. However, results here suggest that even in the absence of a real change in BMI obese adolescents can hold the perception that they are improving body composition and physical fitness by participating in regular exercise. It was clear from participants' responses that the intervention had reduced their perceptions of feeling '*like a slob*', suggesting the experiences during the intervention had provided participants with a sense of a healthier identity. It is likely that this resulted from being proactive about trying to reduce their weight and becoming more active. That said, weight loss was not a key aim of the intervention since the premise was to concentrate on equipping participants with the confidence to engage in regular exercise. However, participants appeared primarily motivated

to exercise for weight reduction, which has also been cited as a primary goal of participants attending camp-based studies (Holt et al., 2005). This is understandable given the population, but it also highlights a tension between the aims of the trial and the aspirations and expectations that participants held regarding the intervention. If left unresolved, social cognitive theory (Bandura, 1977) hints that the discrepancy between outcomes, expected outcomes and the value placed on achieving these outcomes could lead to a decline in efficacy and a lapse in maintaining healthy behaviours in this instance. It is important that future interventions are aware of this potential discrepancy and clearly describe the research aims to participants at the outset, as was the case in this study.

6.8. DISCUSSION OF THE 14-WEEK INTERVIEWS:

6.81. Maintaining behaviour change

The 14-week interview provided obese young people with an opportunity to comment on their experiences of trying to maintain 'healthy behaviours' during the home programme phase of the trial. The results showed that for a large proportion of participants the home programme had been a positive experience with some evidence that individuals had maintained exercise behaviours and even increased their participation in exercise. What is particularly encouraging is that some of the obese youngsters expressed determination that these newly adopted 'healthy behaviours' were going to become long-term habits - *I've been going to the gym at school, I've been to the table tennis club and I've been doing some sports like basketball and football at school..... Yeah, I think it's going to be a long-term thing. I'm going to try and stick with it.* Interview scripts also suggested a link between exercise and improved self-esteem with participants reporting that they felt better about themselves as a result of maintaining exercise and were fitter, happier - *I am fitter than I actually thought, and I can be a lot fitter. I don't have to stop as often when I'm doing exercise no.....how does that make you feel?....Brilliant,* and not as peripheral to social networks or bullied as often - *I've got*

more friends now...and you think that's the result of the exercise do you? Yes I used to get punched a lot. Such comments are particularly encouraging given that poor self-esteem and being peripheral to social networks are overwhelmingly reflected in the literature as barriers to exercise for overweight and obesity among youth (Philips & Hill 1998; Strauss & Pollack, 2003). Therefore, overcoming such barriers should not only increase self-esteem but also positively influence dimensions of efficacy, which has shown to be central to the prediction of future behaviours (Bandura, 1997). However, whilst the results are encouraging, they are still relatively short term in the context of changing behaviour and further longitudinal evidence is required to fully substantiate this claim.

6.82. Exercising independently

Participants reported consistent increases in physical activity over the home programme phase of the study - *I've been playing more football in school and I've been doing a bit more exercise. A bit more football, I play football every lunch-time now,* which is in contrast to previous research indicating a decline in children's physical activity over time (Sallis, Alcaraz, McKenzie & Hovell, 1999). An explanation for these findings might be that there exists a relationship between children's perceptions of physical competence and engagement in physical activity. Previous studies investigating this relationship support this view (Faucette et al., 1995; Janz et al. 1995) and recently (Wright et al., 2005) a significant positive relationship among perceived physical ability, enjoyment of exercise and physical activity effort, suggests that participants who have higher perceived physical ability are likely to work harder in physical activity. With this in mind, results from the 14-week interviews indicate physical self-efficacy appears to be a strong predictor of motivational responses in physical activity. Additionally, obese individuals can maintain physical activity providing that they have learned how to do so correctly and experienced some efficacy from engagement in the first instance - *It got me to understand that exercise is something you need to do, it is not something you can just throw off or make up.*

A further explanation for the comments here could be that the intervention helped change the cognitive determinants of physical activity, which has been promoted as being a primary goal in health promotion activities (Heitzler et al., 2006). Cognitions like attitude, subjective norm and self-efficacy are important in the process of habit-formation (Aarts *et al.*, 1997; Meertens *et al.*, 2000) and often previous interventions have omitted a cognitive component. The processes of change described within the TTM underpinned the exercise therapy sessions. The efficacy of TTM interventions to promote physical activity has demonstrated success in adult populations (Cardinal & Sachs, 1996; Woods, Mutrie & Scott, 2002) and there is evidence here of its potential success with obese adolescents. In accordance with the principles of TTM the exercise counselling sessions used a variety of cognitive and behavioural techniques to promote positive exercise attitudes and psychological states. Whilst the influence on behaviour of each individual process was not measured, there is evidence from the 14-week interviews to suggest that conscious raising, self-evaluation, counter conditioning and self liberation exerted an influence on behaviour - *I enjoy it more now, because I know it's helping me, but before I wasn't that bothered, but now I've started to do something and it's helping me, so I like doing it more rather than not bothering to do it.* These findings are supported by previous research (Nigg & Courneya, 1998) indicating that adolescents seek out information to increase their awareness and reinforce their participation in exercise. Furthermore adolescents, like others, reappraise their value system with respect to the role of exercise leading to the consideration of and participation in exercise over the longer term (Nigg & Courneya, 1998).

Interview responses also indicated the existence of helping relationships or social support which is consistent with previous research suggesting that adolescents accept and use support from others to engage actively in exercise (Marcus et al., 1998) - *I've started going swimming*

three times a week before school....mum and I started that when I finished here, I've benefited from it, so I think I may as well if it's going to help me, I may as well do it. This is particularly encouraging given that research with other populations has stressed the importance of a support system when attempting exercise behaviour change (Nigg & Courneya, 1998). However, it is important to note that one participant reported that despite initiating new exercise behaviours they were not maintained, citing lack of support as the reason. Future studies might wish to explore the need of obese individuals to enlist social support to help maintain positive health behaviours. The role of the parents as supporters of change might also be important given that children's positive outcome expectations or beliefs about the benefits of participating in physical activity have shown to be strongly related to parent's beliefs concerning physical activity participation (Heitzler et al., 2006).

6.83. The exercise diary intervention

The use of the exercise diary as a tool to help maintain healthy behaviours received mixed comments. Filling out the exercise diary for some was seen as a positive and useful experience. Comments provided support for its use as motivational tool by reminding individuals of their achievements, thereby building efficacy and promoting perceived behavioural control (PBC) - *It was good because it showed me what I had actually been doing. I did look back and it had done a lot more than what I thought I had. It just showed me what I could do and what I was capable of doing.* The theory of planned behaviour (Ajzen, 1988) suggests that individuals high in PBC hold the perception that they possess the resources and the opportunity to execute healthy behaviours. Furthermore, that PBC is a direct determinant of behaviour itself. With this in mind, comments suggest that the exercise diary was a valuable adjunct to the goal setting facet of the home programme. The qualitative evidence is also supported by the quantitative difference in PBC observed between exercise therapy and usual care participants at follow-up. Conversely, several responses indicated that the exercise diary was of little use, suggesting that filling it out was difficult and labour

intensive. Participants also commented that they thought other people might believe it to be of use, but that the participant perceived it to be disheartening and only acted as a reminder of how little exercise they did. This dissonance could be explained by the theory of reasoned action (Ajzen & Fishbein, 1974). It is clear that the participant was aware of the positive social norm concerning the exercise diary but they perceived the exercise diary to be demotivating and provided an indication of their failure to achieve set goals, diminishing self-efficacy. Based on the interview comments, the usefulness of the exercise diary to promote and maintain healthy behaviours in obese adolescents differed between individuals. It is important that future studies are aware of the subjective nature of such adjuncts and it might prove beneficial to determine an individual's attitude towards diaries and alike prior to their use.

6.84. Body Consciousness, physical self perceptions and self perceptions

Participants reported discernable change in body consciousness, physical self perceptions and self-perceptions supporting the main trial outcomes. There was an overwhelming sense that participants were surprised by how much exercise they could do and that they were actually fitter than suspected. Such emotions were also positively impacting self-esteem- *I am fitter than I actually thought, and I can be a lot fitter. I don't have to stop as often when I'm doing exercise no.....how does that make you feel? Brilliant* and domain specific esteem - *A lot better about myself, you know it makes me confident, pushing yourself further each time and stuff like that.* Participants also commented on specific improvements to self-efficacy - *like before, I just thought "oh well I'm just overweight, I can't do anything about it", but now because I've started exercising and eating differently, then I've thought "well I can change", you know* and hinted that the programme had had a positive impact on their wider quality of life - *I've got more friends now...and you think that's the result of the exercise do you? Yes.* As such, future studies might wish to evaluate the impact of treatment programmes in terms of quality of life measures. Furthermore, several participants referred to having an improved

body shape and that this provided a source of motivation to continue to exercise. Related to this authors have suggested that exercise can provide proprioceptive feedback regarding improvements in the overall functional ability of obese individuals' bodies (Wills et al., 2006). This is important since obese adolescents often have very negative feelings about their bodies and feel there is very little that they can do to change their body composition. These qualitative responses are also interesting because the main trial did not report quantitative differences in BMI scores at eight-week follow up, which suggests that overweight young people might gain some perceived benefit from exercise in terms of body shape in spite of a lack of weight loss.

6.85. Lessons learnt from participating in the study as a whole

One of the aims of the exercise therapy counselling was to provide obese individuals with the knowledge and skills to become more active. Central to this was developing an understanding as to why it was important for individuals to exercise. Exercise has shown to positively impact both physiological and psychology health (DoH, 2004). Studies have reported a positive association between exercise and physiological outcomes in the obese population (Marks, et al., 1995; Saris, 1993; Schwingshandl et al., 1999). An increasing body of research on physical activity indicates positive effects on mental health outcomes (Erikssen 1998) and self-esteem (Ekeland 2003) in adults. Similar positive effects on specific problems like depression, anxiety, hyperactivity and conduct problems in children and adolescents have been reported (Biddle, 1993; Calfas, 1994; Mutrie, 1998). Comments from the 14-week interviews suggest that this approach was successful in raising awareness as to the benefits of an active lifestyle - *I enjoy it more now because I know it's helping me, but before I wasn't that bothered, but now I've started to do something and it's helping me, so I like doing it more rather than not bothering to do it.* There is also further support for the mental health benefits of exercise. Several participants reported that exercise made them feel good about themselves and in particular these comments related to feelings immediately post exercise - *The feeling*

afterwards mainly, you feel a lot better about yourself and if you haven't done any you feel like you've got nothing done. Given that exercise is inexpensive, has few negative side effects and can be self-sustaining, once the basic skills have been learnt (Crawford 2002) there appears much to commend its use in the treatment of obesity. It might be important for future programmes to include an educational and conscious raising component. That said, simply providing the relevant health information is not enough to induce behaviour change (Murtagh et al., 2006) and instead interventions should be encouraged to provide a theoretical underpinning to their approach.

6.9. STRENGTHS AND LIMITATIONS

The findings should be interpreted in light of several strengths and limitations.

Previous research (Walker et al., 2003) investigating the impact of a treatment intervention for childhood obesity was restricted to a selected group of 40 girls. Given the reported differences in exercise motivation (Gillison, Standage & Skevington, 2006) and psychopathology variables (Wardle et al., 2006) between genders, the mixed gender sample here might offer more representative views of the exercise experiences of obese adolescents seeking treatment.

While every attempt was made to minimise the bias of participant responses during the interviews we must be mindful of a potential halo effect and the desire of participants to be viewed in a favourable light by the researcher. Interviewing children has been shown to be a difficult task. With obesity being such a sensitive issue there is a danger of participant responses being lead by the semi-structured nature of the interviews. Future studies might wish to investigate alternative interview methods such as unstructured or free ranging questions to avoid such bias.

6.10. CONCLUSIONS

The eight-week and 14-week qualitative studies aimed to inform the design of future interventions by better understanding the exercise needs and experiences of obese adolescents

seeking treatment so that they can be better served by researchers and health professionals' in the future. The results support previous studies that suggest perceptions of competence and self-efficacy are considered strong determinants of physical activity among older children and adolescents. The qualitative findings represented here also propose that participation in a supervised exercise therapy intervention can improve measures of physical self-worth and increase physical activity in obese/morbidly obese adolescents over time. Participant experiences add foundation the use of short intermittent bouts of exercise to increase the likelihood of adherence to treatment programmes. The usefulness of the exercise diary to promote and maintain healthy behaviours in obese adolescents was subjective as it's success varied between participants. Further studies are required to determine the full extent of potential benefits of similar home programmes. Researchers might also wish to explore ways that the obese individuals can enlist social support to help maintain positive health behaviours. Findings suggest the role of the parents as supporters of change might also be important in that children's positive outcome expectations or beliefs about the benefits of participating in physical activity have shown to be strongly related to parent's beliefs concerning physical activity participation. Results highlight that perceptions of weight status can be altered without corresponding changes in actual body mass, suggesting that studies might be better served focusing on strategies to promote positive exercise experience for obese young people as opposed to focusing intervention solely on weight status. Findings also indicate that obese adolescents respond well to activities that are easily mastered. On the basis of this future treatment programmes should incorporate elements of self-esteem enhancement to exert the greatest influence on the exercise behaviour of obese adolescents. Additionally, greater emphasis within intervention programmes needs to be placed upon educating obese young people about the wide range of health benefits that exercise can provide, and that weight loss, whilst important, is only once such benefit.

To conclude, these qualitative studies have highlighted the importance of assessing the efficacy of obesity treatments from a participant perspective and offer much to advocate exercise therapy as a viable means of treatment for the psychopathology associated with obese adolescents seeking treatment. Furthermore, findings here support the call that a health-centred rather than weight-centred approach for the treatment and prevention of childhood obesity might be more appropriate.

7.0. RATINGS OF PERCEIVED EXERTION OF OBESE

ADOLESCENTS

7.1. INTRODUCTION

The increasing prevalence of childhood obesity represents a significant health concern and challenge (Jelalian, Wember, Bungeoth & Birmaher, 2006). The physical fitness of obese children is worse than that of normal weight children (Goran et al., 2000) and recent reviews have confirmed that there is evidence of alterations to both musculoskeletal structure and function as a consequence of excessive weight bearing in children (Hills et al., 2002). Studies have indicated that obese children have significantly flatter feet, larger legs and increased foot pressures (Dowling, Steele & Baur, 2001) that are likely to lead to lower limb pain during activity. Clinical management and public health strategies to combat the problem have been limited in method and scale (Summerbell et al., 2003). Typically, interventions for the treatment of childhood obesity target increases in physical activity (Reilly & McDowell, 2003). However, given that obesity has shown to limit muscular strength and power (Miyatake et al., 2000) and increase mechanical stress on the lower limbs resulting in discomfort during exercise (Loke, 2002), the mode and intensity of exercise employed within such treatment interventions could be inappropriate for obese individuals. Offering a programme of exercise that is painful and therefore un-enjoyable to obese individuals might diminish physical activity motivation resulting in increased sedentary behaviour, perpetuating the cycle of their obesity. To inform the design of future physical activity treatment interventions for the obese young people, understanding the feelings and sensations experienced by this population during exercise would appear worthwhile.

7.11. Ratings of perceived exertion

Ratings of perceived exertion (RPE) offer a non-invasive approach to evaluating exercise experiences. RPE are frequently used as an adjunct to standard physiological responses in clinical and non-clinical settings (Eston & Connolly 1996; Marinov et al., 2003). Since perceptions of exertion are related to respiratory, metabolic, and peripheral physiological mediators, RPE provides similar information regarding functional exercise tolerance as physiological responses (Borg, 1990) but requires no biomedical instrumentation and is therefore inexpensive. Recording an individual's RPE during defined steady state workloads can be useful in exercise prescription. RPE also provides an objective indicator through which it is possible to compare the relative degree of fatigue attained during subsequent testing (Borg, 1982). Thus, if aerobic capacity and treadmill performance significantly increased or decreased and the endpoint RPE remained the same between test results, the tests could then be interpreted as representing a true change in cardio-respiratory fitness or medical status and not a reflection of whether the patient pushed hard enough. This could be particularly useful with obese adolescents who might have limited desire to push themselves at the on-set of an exercise programme due poor self-efficacy. In adults RPE have commonly been used in assisting with the prescription and monitoring of physical activity and there is some evidence of the use of RPE with children (Duncan, Mahon, Gay & Sherwood, 1996; Eston & Lamb, 2000; Lamb & Eston, 1997). Research investigating RPE in obese adolescents is lacking. Previous studies with children of normal weight have tended to define RPE only in terms of aerobic fatigue (breathlessness) (Marinov, Kostianev & Turnovska, 2002; Pender, Bar-Or, Wilk & Mitchell, 2002). However, given the impact of obesity on the lower limbs (Loke, 2002) it seems appropriate to also investigate RPE in terms of lower limb fatigue with the obese population. Differentiated RPE have been investigated in children previously. A study by Mahon and colleagues (1998) examined overall, leg and chest ratings of perceived exertion (RPE) at ventilatory threshold in 16 young children (mean age 10.9 years) and compared them

with ratings from 17 young adults (mean age 24.3 years) during a graded exercise test on a cycle ergometer. Results showed that compared to adults all RPE values were higher for the children ($P < 0.05$) and within each group overall and leg RPE were higher than for the chest. Mahon et al., (1998) concluded young children are able to discriminate exertion in different parts of their body and require a greater overall, leg and chest effort to exercise at an intensity corresponding to ventilatory threshold compared to adults. This indicates that children experience more pronounced cardio-respiratory and muscular sensations during exercise and that there exists a difference between chest and leg RPE during cycle ergometry. However, the sample size was small and as a result generalising the findings across a wider population is limited. The sample consisted of normal weight children (BMI was 17.78 based on mean height and weight for the sample) and as a result further research is required to determine if lower limb RPE differs from aerobic RPE in obese adolescents. Mahon and colleagues (1998) employed the Borg (6-20) scale (1986) to assess RPE. Whilst the authors stated that every effort was employed to familiarise the participants with the scale, there is evidence that both the wording and the range of numbers used in the 6-20 RPE scale confuse young people (Williams et al., 1994). Therefore, although children might assimilate the idea of the RPE scale, future research adopting a child specific version could be more meaningful.

7.12. Children specific RPE scales

A number of more appropriate child-specific rating scales have recently been designed, including the Pictorial Children's Effort Rating Table (Yelling et al., 2003). Whilst the reliability and validity of such scales has yet to be indisputably established, studies in young children (aged 8 to 11) using PCERT have shown it to have greater validity when compared to the traditionally adopted Borg 6-20 RPE scale (Lamb, 1995; 1996). Furthermore, scales that involve a pictorial element may promote a greater conceptual understanding for young people (Noble & Robertson, 1996). The PCERT scale, which uses pictures as well as descriptive language, was found to reflect well the changing physiological demands of given

exercise tasks. Yelling and colleagues (2002) reported that during exercise children appeared to be able to use their effort perception to increase or decrease the intensity of their effort to match a range of prescribed effort levels.

7.13. RPE using cycle ergometry vs. treadmill exercise

The use of a cycle ergometry as adopted by Mahon and colleagues (1998) also has limitations. Physiological responses to exercise on a cycle ergometer differ from those obtained on a treadmill (Hambrecht et al., 1992) and cycle ergometry as a mode of exercise testing has shown to be limited by local muscular fatigue (Coyle, Coggan, Hopper & Walters, 1988), which might explain the difference in RPE reported by Mahon and colleagues (1998). The purpose of this study was to examine the exercise experiences of obese adolescents in terms of perceived exertion to determine if there exists a difference between aerobic and lower limb RPE. Furthermore, to investigate RPE using a children specific scale and thereby address the shortfalls of previous research. It was hoped outcomes from this study would inform the design of future physical activity treatment interventions involving obese adolescents by providing insight into the exercise experiences of this population. The study hypothesised obese participants would report significantly higher ratings of perceived exertion for the lower limbs compared with ratings for aerobic fatigue during a multi staged exercise test.

7.2. METHOD

A total of 81 obese (18 morbidly obese, BMI >3.5 SDS, adult equivalent BMI of ≥ 40 with Mean weight = 89.7 kg) adolescents aged 11-16 years (Mean 13.1 \pm 1.7) completed a modified version of the Balke multi-staged exercise protocol (Rowland, 1993) as part of the baseline assessment procedures in the main trial. Participants were asked to estimate the degree of exertion they felt whilst exercising firstly in terms of aerobic exertion (ARPE) defined as feelings that related to breathlessness/being out of breath (dyspnoea) and secondly

specific to lower limb fatigue/pain (LRPE). Ratings were recorded in the final 10 seconds of each 2-minute stage using the Pictorial Children's Exercise Rating Table (Yelling et al., 2002).

7.3. STATISTICAL ANALYSIS

A fully repeated-measures factorial ANOVA was used to compare RPE outcomes of ARPE and LRPE. Post hoc tests in the form of paired t-test with Bonferroni adjustment in accordance with recommendations by Field, (2000) were used to identify the location of any difference. Pearson's product moment correlation coefficient was employed to determine the extent to which heart rate and RPE were related across each exercise stage.

7.4. RESULTS

Data from the first three stages of the exercise protocol was used for analysis. Previous studies using a similar exercise protocol found the duration of exercise for obese individuals to be significantly shorter than that of normal weight controls (Marinov et al., 2002) with mean time to exhaustion 9.1 minutes (this included a two-minute warm up period). With this in mind, to limit drop-out and increase generalisability, all participants (N=72) who completed six-minutes of the exercise protocol were entered for analysis. A fully repeated-measures factorial ANOVA showed that LRPE and ARPE differed at each stage of the exercise protocol and across time (*P at least 0.004*) in all cases (Table 7.1). Post hoc tests revealed LRPE to be significantly greater (*P < 0.002*) than ARPE at each stage of the exercise protocol. The mean difference between LRPE and ARPE increased with time and exercise stage. Pearson's product moment correlation coefficient revealed that heart rate held a stronger relationship with LRPE compared to ARPE across each exercise stage (Table 7.2). Mean heart rate (HR) for stage one, two and three was 143 (± 13), 158 (± 13) and 170 (± 13) respectively.

Table 7.1. Stage mean RPE scores for the modified Balke protocol

Stage	LRPE (SD)	ARPE (SD)	Mean Diff	t-statistic	Sig.
1	3.81 ± 1.32	3.51 ± 1.04	.300	3.282	<i>p</i> < 0.002
2	5.46 ± 1.52	5.03 ± 1.33	.430	5.527	<i>p</i> < 0.001
3	7.18 ± 1.63	6.51 ± 1.46	.667	5.617	<i>p</i> < 0.001

(N=72)

Table 7.2. Stage heart rate, ARPE and LRPE correlations for the modified Balke protocol

Stage	HR vs. ARPE		HR vs. LRPE		ARPE vs. LRPE	
	(<i>r</i>)	Sig.	(<i>r</i>)	Sig.	(<i>r</i>)	Sig.
1	.276	$p < 0.013$	.317	$p < 0.004$	.786	$p < 0.001$
2	.407	$p < 0.001$	.431	$p < 0.001$	.889	$p < 0.001$
3	.447	$p < 0.001$	.480	$p < 0.001$	.788	$p < 0.001$

(N=72)

7.5. DISCUSSION

Whilst the exercise capacity of obese children has been investigated extensively (Marinov & Kostianev, 2003; Norman et al., 2005; Tang, Lee, Chen, Hwang & Chao, 2002), few studies have investigated their exercise experiences in terms of perceived exertion. Where studies have investigated differentiated RPE (Mahon et al., 1998) they have been limited by sample size, method and restricted to children of normal weight. Therefore, the aim of this study was to examine obese adolescents RPE in terms of lower limb and aerobic exertion. It was hoped results would inform the design of future physical activity based treatment by providing incite into the exercise experiences of obese adolescents.

7.51. Body mass, work load and RPE

As hypothesised, ratings of perceived exertion were significantly greater for the lower limbs compared with aerobic exertion for obese children during a staged exercise test. Furthermore, the difference between the two ratings of exertion increased with exercise intensity and duration suggesting that obese individuals might find prolonged bouts of exercise particularly fatiguing in the lower limbs. Findings here support the research of Mahon et al., (1998) indicating that sensations arising from the lower limbs during graded exercise are perceived more intensely than overall exertion by children and adolescents. This observation is consistent with the notion that peripheral factors are the predominant sensory cue at low-to-moderate exercise intensities (40 -59% HRR) (Robertson 1982). Furthermore, on the basis of the slightly stronger correlation with HR, lower limb exertion might offer a more appropriate measure of cardiovascular effort than ARPE. Further studies are required to substantiate this claim. Mahon et al., (1998) proposed that sensory mechanisms associated with the mechanical aspects of muscle activation accounted for the RPE differences in normal weight children. This was based on children not experiencing the same degree of metabolic acidosis as adults. However, it is unknown if this relationship remains consistent for obese adolescents.

Although speculative, it could be argued that the obese children observed here closer resembled adults in body size and mass (Mean kg=89.7) and as a result of this increased mass are required to work harder, both aerobically and peripherally for the same exercise load when compared to normal weight children. This increase in work effort in the lower limbs might increase metabolic acidosis leading to increased peripheral fatigue and exercise cessation. Further research is required to fully clarify this suggestion.

7.52. Physiological mediators of effort

Whilst it is unlikely that the precise relationship of cause and effect will be clearly established in terms of the findings reported here, it might be of interest to reflect on the physiological factors that mediate the perception of effort in obese adolescents and how these factors might differ in children of normal weight. Although there is currently a lack of information pertaining to the structural and functional limitations imposed by overweight and obesity relative to the extensive literature now available on many aspects of the obese condition there is evidence that obesity has a negative effect on musculoskeletal indices. As mentioned studies have indicated that obese children exhibit significant physical differences to the lower limbs compared with children of normal weight. With this in mind, an explanation of the findings could be that physiological adaptations to lower limbs of the obese sample raised foot pressures, which lead to increased perceived exertion in the lower limbs during activity. In support of this, obese pre-pubescent children have exhibited higher pressures under the forefoot during walking compared to their non-obese counterparts (Dowling et al., 2001) with the authors arguing that foot discomfort associated with this increased forefoot plantar pressure might hinder obese children's participation in physical activity due to weight-bearing activities being 'uncomfortable'. It is possible that these musculoskeletal adaptations could be improved with an appropriate prescription of aerobic and resistance weight training and research investigating this relationship appears worthwhile.

7.53. The influence of RPE on physical activity participation in obese adolescents

The management of weight and the promotion of appropriate physical activity with the obese population should be one of the highest priorities given that physical activity has shown to be the best predictor of weight loss maintenance amongst obese individuals (Wadden, Brownell & Foster, 2002). However, results from this study suggest that lower limb exertion is an issue for obese individuals. Based on the findings here obese children might be inclined to avoid exercises that require prolonged use of their lower limbs to avoid the on-set of peripheral fatigue. Instead they might remain sedentary for prolonged periods, resulting in reduced energy expenditure thereby increasing the likelihood of a positive energy balance and perpetuating the cycle of obesity. Taking this into account it is reasonable to suggest that the success of treatment programmes is likely to be influenced by the type and duration of physical activity. Engaging obese adolescents in sustained bouts of physical activity that rely heavily on the lower limbs such as jogging or running, could be responsible for lower limb fatigue that could lead to exercise cessation. Instead, activities that incorporate the upper body and reduce impact on the lower limbs such as rowing might encourage exercise participation and facilitate longer term adherence. As this notion is speculative, further research is warranted to examine the relationship between lower limb fatigue and energy expenditure in obese children. Comparative studies with children of normal weight would also be of use given the high levels of sedentary behaviour and low levels of habitual physical activity that are typical of modern children (Reilly, 2006).

7.54. Self-efficacy and RPE

The perception held by obese adolescents' of their ability to exercise is likely to be heavily implicated in their capacity to tolerate exercise load. In the adult population for example, low exercise self-efficacy has been associated with greater perceived exertion during exercise (Rudolph & McAuley, 1996). With this in mind, self-efficacy theory could offer a possible explanation for our findings. Bandura (1986) proposes an individuals sense of efficacy and

how they then perceive and interpret somatic and emotional states during activity, can influence mood and domain specific self-esteem. Individuals with a low sense of efficacy, such as obese adolescents seeking treatment (Zeller et al., 2004), are likely to associate the stress reactions and tensions experienced during physical activity as signs of vulnerability, physical debility and/or poor performance. This could negatively influence self-esteem and diminish physical activity motivation. Furthermore, as such tensions are likely to be a result of the increased mechanical stress (Loke, 2002) and anatomical adaptations (Dowling et al., 2001) of being obese, it seems important for researchers to be aware of such adaptations when designing treatment protocols. On the basis of this, it is proposed that engaging obese individual's in short intermittent bouts of physical activity could offer less in the way of stress thereby making exercise more enjoyable, increasing self-efficacy and increasing the likelihood of long-term adherence. This is supported through Reilly (2006) who suggested that obese children and adolescents generally have limited exercise tolerance and as such may be more amenable to small increases in physical activity.

7.6. STRENGTHS AND LIMITATIONS

Whilst the effects reported here might have implications for the use of RPE in future interventions aimed at treating obesity in adolescence, the findings should be interpreted in light of several strengths and limitations. The inclusion of both a protocol to assess both aerobic and lower limb RPE is a significant advancement on previous research. The sample size of the study was also larger than previous studies (Mahon et al., 1998; Marinov et al., 2003) investigating RPE in obese children. Past studies that have examined RPE in children have often used scales validated for the adult population (Mahon et al., 1998), the scale used in this study was a validated child specific tool for the assessment of RPE. However, the PCERT scale has not been validated as a tool to assess lower limb ratings of perceived exertion alone and further research is required to determine if the PCERT scale can be validated for this use. Heart rates and PCERT ratings recorded here were similar to those

found during validation of the PCERT scale (Yelling et al., 2001) strengthening the validity of the PCERT as a child-specific perceived exertion scale and supporting its use in this study. It has been suggested that the incremental nature of graded exercise protocols potentially exert an influence over children's effort ratings (Lamb & Eston, 1997). However, participants here were able to distinguish between two separate ratings of perceived exertion for the same exercise intensity suggesting that the PCERT scale allows sensitive yet actual differences in exertion to be determined. Further research is required to fully validate this interpretation. The simple 1-10 scale was easily understood by participants and the opportunity to communicate perceived effort with finger signs was an additional advantage and one which has been noted in previous studies of this nature (Marinov et al., 2003). The absence of a control group of normal weight children is apparent and the author recognises that the study would have been strengthened had a control been included, although due to time constraints this was not possible. Whilst there is already published literature concerning the RPE during exercise for normal weight children, studies that compare differential RPE between overweight/obese children and their normal weight counterparts are needed to fully determine whether lower limb RPE is more of an issue for obese young people.

7.7. CONCLUSIONS

In summary, findings here underline the need for future interventions aimed at treating obesity to be aware of the importance of assessing ratings of perceived exertion during exercise. Moreover, studies might wish to adopt a measurement protocol that includes ratings for the lower limbs and not only aerobic exertion. It is important that studies are aware of the musculoskeletal differences that might manifest in obese children and adolescents and account for these differences in exercise prescription. Short intermittent bouts of physical activity including non-weight bearing activities such as swimming/rowing could make exercise more enjoyable thereby increasing the likelihood of long-term adherence. Building self-efficacy through successful completion of exercise tasks might aid obese individuals to

tolerate exercise load and promote positive change to domain specific self-esteem. Similar research investigating differential RPE between overweight and normal children is required to fully substantiate these claims.

8.0. IMPLICATIONS FOR PRACTICE FROM THE THESIS

There is a lack of quality evidence for specific interventions aimed at treating childhood obesity (Reilly, Wilson, Summerbell & Wilson, 2002; Whitlock, Williams, Gold, Smith & Shipman, 2005). Furthermore, health professionals, teachers, and parents appear to lack the confidence, time, knowledge and skills to treat it effectively (Story et al., 2002). High non-attendance, dropout, and lack of success are common in treatment programmes (Quattrin, Liu, Shaw, Shine & Chiang, 2005). With this in mind, the following chapter aims to summarise the ‘implications for practice’ from the thesis. Using evidence from the main trial (Chapters 3.0, 4.0 and 5.0), the qualitative research and RPE studies (Chapters 6.0 and 7.0) and supported with personal reflections and experiences, practical suggestions regarding the implementation of exercise therapy will be offered so that health professionals are better served to meet the needs of obese youngsters in future interventions. For the purposes of clarity implications for practice will be sub-divided in four components; screening for psychopathologic outcomes in obese adolescents; delivering treatment interventions to obese adolescents; the role of physical activity in exercise therapy; delivering exercise therapy counselling - practical examples.

8.1. EXERCISE THERAPY TOOLKIT

Figure 8.1 represents an exercise therapy tool kit. It is hoped that the tool kit will provide health professionals and researchers with a checklist of components that might facilitate successful implementation of exercise therapy in future treatment interventions for obese adolescents. Furthermore, the application of a consistent protocol is likely to preserve the internal and external validity of studies (Bellg et al., 2004) and might remove some of the ambiguities inherent in counselling for changes in health behaviour (Long et al., 1996).

Figure 8.1. Exercise therapy tool kit – exercise counselling

- Combining positive exercise/mastery experiences with a cognitive approach to promoting health behaviour change appears pivotal to the success of exercise interventions aimed at reducing psychopathology outcomes
- Moderate intensity, short bouts of exercise are sustainable for obese adolescents
- Interventions that adopt exercise as a mode for treatment of childhood obesity should be enjoyable for those taking part.
- A range of aerobic exercise modalities, such as stepping, cycling, seated rowing, dance mat and/or walking should be encouraged.
- A period of practice (of at least 10-minutes duration) for each participant with every piece of equipment proved beneficial with regard adherence.
- Mini games included within sessions promote fun, provide an opportunity for personal development and introduce a small self-referenced competitive element to the sessions and also helped build up a rapport with participants
- Establishing and maintaining a meaningful relationship between clinician/health professional and participant is central to open and honest discussions.
- One-on-one style counselling environment promoted discussion of sensitive issues and thus potentially more effective.
- In terms of exercise adoption, a one to one approach enabled participants to receive a concentrated period of support to learn the basics of exercise technique.
- Where interventions involve substantial amounts of contact time between participant and researcher/practitioner it seems essential to control for the potential positive effects of this attention
- The behaviour matrix might be a useful tool to raise awareness of physical activity and eating patterns and help individuals gain an insight into the long-term impact of unhealthy or indeed healthy behaviours.
- Whilst referrals from health professionals offer a valuable source of potential participants, it is important that future randomised controlled studies do not rely exclusively on this type of recruitment.

8.2. SCREENING FOR PSYCHOPATHOLOGY IN OBESE ADOLESCENTS

Baseline data from the trial revealed that a large proportion of participants reported clinically significant depressive symptom scores that were comparable with those reported by paediatric cancer patients (Schwimmer et al., 2003). It is important therefore that future studies include a multidimensional psychosocial assessment of obese children and adolescents as part of screening for study entry and subsequent follow-up assessments. Furthermore, study data advocates that any assessment might wish to include several domain-specific measures of self esteem, a screening for psychopathology, and an assessment of factors or motivations related to seeking treatment. In addition, Epstein and colleagues (1994) suggested that the degree of psychopathology in the parents of obese children seeking treatment should also be assessed. From an ethical/health perspective, measures ought to be in place to support those obese children who report consistent clinical depressive symptoms.

8.3. RECRUITMENT TO TREATMENT INTERVENTIONS

Previous studies involving obese young people have often been limited by small sample sizes (Summerbell et al., 2003) suggesting there might be issues regarding the recruitment of obese young people on to treatment programmes. Recruitment strategies for this population are poorly described and information about the effectiveness of previous recruitment strategies is limited. The dearth of information regarding this issue might also have implications for the level of statistical power that can be demonstrated by trials and their subsequent value. To inform the recruitment efficiency and programme effectiveness of future interventions aimed at treating obesity in young people, the following section offers insight into the recruitment process of the SHOT trial. Recruitment to the study represented an on-going challenge and consumed a large amount of researcher time and resource. In the first instance referrals from paediatricians and dieticians based at a local children's hospital provided a large number of potential participants and it was encouraging to have the consistent and determined support

from senior health professionals. However, within an 18-month period this route of referral was exhausted and it was deemed necessary to draw upon the considerable reach and immediacy of community recruitment strategies such as local press, radio and community adverts to access potential participants. Whilst referrals from health professionals offer a valuable source of potential participants, it is important that future randomised controlled do not rely exclusively on this type of recruitment. Therefore, alternative recruitment strategies should be considered in conjunction with this approach. These alternative strategies should be conceived at the design phase of any intervention to ensure ethics approval of any recruitment strategies. Perhaps encouragingly, there was no significant effect for recruitment route in SHOT, indicating that participants did not vary on the study outcomes according to whether they entered the trial via hospital referral or community advertisements.

8.4. DELIVERING TREATMENT INTERVENTIONS TO OBESE ADOLESCENTS

Adolescence has been termed a 'critical period' for the development of adult obesity and is a time of change and emerging independence (Dietz, 1997). Adolescents are one of the most challenging clinical research groups to work with (Steinbeck, 2005). There has been few randomised clinical trials of obesity management among adolescents (Summerbell, 2003) and as such there is little pragmatic evidence or guidelines of how best to work with obese youngsters during treatment. Therefore, the results of this study might be of particular interest to allied health professionals and exercise specialists who are tasked with treating obese children. Previous research has shown that obese adolescents require much more negotiation of behavioural change as compared with adults (Flodmark et al., 1993). This study demonstrated that a one-to-one style of counselling facilitated an environment that was conducive to promoting behaviour change in obese adolescents. Specifically, one-to-one contact was central to establishing and maintaining a meaningful relationship between researcher and participant, which provided opportunity for open and honest discussions around potential areas of behaviour change. Furthermore, sensitive issues such as weight

status and body image were not inhibited by parental influence, which has been an issue previously (Brownell et al., 1983). Although anecdotal evidence, these comments are based on the experience gained from delivering an exercise therapy intervention and might provide valuable insight for health professionals of how to successfully offer treatment to obese adolescents. Evidence based support for these comments lies within the excellent adherence rates to the exercise therapy intervention. Previous studies have often suffered from high non-attendance and dropout (Quattrin et al., 2005) and comments here add considerably to the evidence base on treatment of childhood obesity, particularly in terms of the pragmatics of delivering interventions. However, despite excellent retention rates for SHOT exercise adherence is susceptible to fluctuations in attendance. With this in mind, further research is needed to identify all the potential determinants of exercise adherence in this population. In terms of exercise adoption, the one to one approach was also particularly advantageous in the early stages as it enabled the obese young people, who were essentially novice exercisers, to receive a concentrated period of support so that they were able to learn the basics of exercise technique. Where exercises and pieces of equipment are kept to a minimum this period need only be brief. However, exercise programmes that incorporate more diverse exercise modalities and include exercise progressions may require a greater level of ongoing tutorial support.

There are issues with the one-to-one approach adopted here however that are worthy of brief comment. Obese children lack self-esteem, confidence (Gibson, 2002) and tend to be peripheral to social networks (Strauss & Pollack, 2001) therefore; it seems inevitable that building positive relationships will positively influence domains of self-esteem. Therefore, where treatment programmes involve substantial amounts of contact time between participant and practitioner it is essential that the practitioner be aware of the potential effects of attention and moreover that the programme (exercise therapy in the case of this study) provides the

participants with the skills to be able to maintain healthy behaviours once the support is withdrawn. Conducting exercise sessions on a one-to-one basis is logistically very time-consuming and potentially beyond the remit of most clinical and health service resources. Therefore, future studies adopting a one to one approach might wish to assess the cost-effectiveness of any intervention offered. A logical alternative would be group based exercise sessions. However, given the sensitive nature of obesity and the potential for psychopathology within obese young people, it seems important to consider any potential for harm that might result from group interactions when using this approach.

Results from the perceived exertion study (Chapter 7.0) highlight the need for exercise monitoring during treatment interventions. Practitioners should be responsible for ensuring that participants understand how to monitor their own exercise intensity. It appears that ratings scales such as the PCERT can be understood and interpreted appropriately by obese young people. Furthermore, researchers and exercise therapists should be aware of the potential for participants to over exert themselves as a result of over enthusiasm. Conversely, participants might not reach a minimum requirement during exercise sessions due to low self-efficacy or esteem and thereby inadvertently exercise outside the prescribed exercise dose. Failure to reach minimum exercise intensity might be particularly likely for obese young people who have previously often had poor exercise experiences due to being peripheral to school physical education classes. The appropriate use of RPE scales represents a feasible method of regulating exercise intensity throughout sessions without the need for more expensive methods such as heart rate monitors or online gas analysis systems. The RPE findings also indicate that lower limb exertion might be a better predictor of cardiovascular effort compared to aerobic exertion in obese young people although further research is required to fully validate this.

8.5. THE ROLE OF PHYSICAL ACTIVITY IN EXERCISE THERAPY

At baseline all the participants in this study recorded very low physical activity scores, which highlight the difficulties involved in engaging obese young people in exercise-based intervention programmes (Quattrin et al., 2005). However, results from the trial and comments from the semi-structured interviews suggest that obese adolescents can achieve and maintain moderate intensity exercise over time. As reported in section 5.31 the exercise therapy sessions combined positive mastery experience with a cognitive approach to promoting healthy behaviours. Furthermore, in line with the exercise counselling protocol (Figure 3.1) the first four weeks of the exercise therapy intervention focused around thoughts, attitudes and cognitions towards exercise. Comments from the semi-structured interviews suggest that the inclusion of the aerobic activity made the cognitive process all the more valuable for participants as they felt able to discuss thoughts and feelings about exercise, based on real experiences - *Better to discuss things while you're exercising and you're not just like standing there, 'cos you just get a bit bored"* rather than memory. Importantly, these new exercise experiences were also positive - *' it was fun, it wasn't made hard, it was a challenge sometimes, but it was made fun for me to do'*. To foster feelings of competence towards exercise and ensure that participants derive some sense of efficacy from treatment, future programmes aimed at treating obese young people might wish to adopt similar principles to those outlined here.

A period of practice (of at least 10-minutes) was employed with each participant for each piece of equipment. This is likely to have contributed to positive change in efficacy expectations. In light of this evidence, it is important that future interventions promote positive exercise/mastery experiences and offer bouts of physical activity that are achievable for obese children and adolescents who have previously exhibited limited exercise tolerance (Reilly, 2006). Exercise sessions designed to address psychopathology outcomes in obese

adolescents should also emphasise experiences of success, perceptions of increased physical competence and attainment of goals. Such an approach has also received support from non-randomised research (Gately et al., 2005). In addition, results here suggest that moderate intensity exercises of short-intermittent duration are sustainable for obese children and match DoH (2004) recommendations advocating the use of short bouts of exercise accumulated throughout the day to gain health benefits. As well as being achievable in terms of duration, the exercise counselling sessions offered a range of aerobic exercise modalities; such as stepping, cycling, rowing, dance mat and treadmill walking. Choice has been cited as an important factor in the success of camp-based programmes (Barton et al., 2004; Gately et al., 2000; Gately et al., 2005; Walker et al., 2003) and receives further support from this trial as a retention strategy.

Mini games, which were fun based and introduced a self-referenced competitive element, were also included within sessions. Perhaps importantly, the games provided an opportunity for participants to witness personal development which appeared to encourage perceptions of competence - *I could see the benefits, like my heart rate going down, things like that, it was good to know that it was making me healthier and I enjoyed it really.* Enjoyment of sessions also appears particularly important for retention. Involving children in physical activities that they enjoy is likely to boost their feelings about themselves. Furthermore, intrinsic motives such as enjoyment and satisfaction are repeatedly associated with exercise adherence in other populations (Ingledeew & Sullivan, 2002; Ryan & Deci, 2000). Thus, it is important that interventions that adopt exercise as a mode for treatment of childhood obesity make exercising an enjoyable experience for those taking part.

8.6. DELIVERING EXERCISE THERAPY COUNSELLING: PRACTICAL EXAMPLES

Previous studies examining lifestyle interventions in obese adolescents have often failed to provide detailed information about the content of sessions (Summerbell et al., 2003). This makes replication of methods and an understanding of practically 'what works', difficult. A particular strength of the current study is the published protocol for exercise therapy (Daley, et al., 2005). Building on this, the following section discusses the practical implications of delivering the physical activity counselling within the exercise therapy sessions. It is hoped that this will be of use for future studies wishing to adopt exercise therapy as a treatment for obesity. Where possible, discussions are supported by comments from the semi-structured interviews and/or the main trial results. However, experiences of delivering the intervention are based on personal experience and reflections therefore; any suggestions made should be viewed in light of this.

The exercise counselling took the form of discussions throughout the exercise therapy sessions, with a question-response format often employed. More direct information regarding exercise and diet was given at the end of each exercise period and often incorporated games such as pool, table football, hang-man and table tennis, creating a relaxed environment and facilitating discussion. The games also helped the researcher build up a rapport with participants. Discussing the issue of behaviour change was often a sensitive process and would have proven difficult without first establishing a meaningful relationship between the researcher and the participant - *It just felt like I had done something and it felt in away like I was hanging out with a friend, in away having a laugh and talking and stuff"*. Future studies should be aware of the importance of developing meaningful relationships between participant and researcher and should ensure that practitioners have the skills, knowledge and training to fulfil this role.

8.61. The behaviour matrix

As previously described (see Figure 3.1) the exercise therapy followed the processes of change outlined within the TTM (Prochaska & DiClemente, 1983; Prochaska et al., 1992).

This protocol provided a framework for the methodological procedures and ensured consistency throughout the intervention. In addition to this model, there were several practical tasks that were included in sessions that future studies might wish to employ. One such example is the behaviour matrix (Table 8.1). The behaviour matrix was an integral part of the exercise counselling sessions and was used by the researcher to help raise awareness of an individual's physical activity and eating patterns. The idea behind the matrix was that often individuals failed to see the long-term impact of unhealthy/healthy behaviours.

The behaviour matrix was delivered as follows: The participant was asked to recall a typical day in terms of their physical activity and eating habits. The frequency of that behaviour was then determined for a day, a week and a month. It became apparent that daily unhealthy behaviours were not associated with long-term ill health by the participant. For example, one participant believed that drinking two cans of carbonate drinks and eating two packets of crisps per day would have little impact upon their health or their weight status. However, by accumulating these behaviours over the period of a week and then a month, the impact to health became more evident, particularly when the individual realised that they were consuming over 70 cans of carbonated drinks per month. Whilst this example highlights the use of the behaviour matrix for unhealthy behaviours, it was also successful in promoting positive ones.

Highlighting the importance of exercise to highly sedentary individuals can be a difficult task, especially if they have no real understanding of 'how much is enough' to retain some benefit to health and moreover hold no positive past mastery experiences on which to draw.

Table 8.1. A completed behaviour matrix for a participant in the exercise therapy group.

Activity/Food	Number per Day	Number per Week	Number per Month
Cans of fizzy drink	2	14	70
Biscuits	4	28	132
TV hours	5	35	175
Bags of Crisps	2	14	70
Internet hours	3	21	105
Sit-ups	10	70	350
10-min walk	2	14	70
Video game hours	3	21	105

Often participants would over estimate the amount of physical activity that was required to derive health benefits and felt that they needed to engage in prolonged bouts of physical activity. Extended bouts of exercise have shown to be a daunting task for reportedly sedentary children (Cooper, et al., 2005), and therefore unlikely to be enjoyable. The behaviour matrix highlighted that intermittent exercise of relatively short duration is not only achievable but could have a positive effect on health. For example a brisk walk for a 10-minute period twice a day was deemed achievable and this equated to over 140 minutes of activity per week and at least 500 minutes per month. Whilst this is still below the recommended dose of physical activity according the DoH, (2004) it was a dramatic improvement on the current exercise habits of the obese adolescent population recruited to this study. In sum, the behaviour change matrix was a useful supplement to the prescriptive exercise therapy protocol. Whilst objective measures are lacking for its effectiveness, practitioner experiences suggest that future interventions adopting a cognitive behavioural approach similar to that described here would benefit from its inclusion. Future studies might wish to investigate the validity of the behaviour matrix as a tool for promoting behavioural change.

8.7. SUMMARY

In summary, it is hoped that the exercise therapy guidelines (Figure 8.1) provided here will help inform future interventions aimed at treating childhood obesity. Furthermore, this thesis might help focus the attention of health professionals and researchers alike as to the importance of understanding the psychological processes involved in behaviour change in obese young people. Findings here suggest that exercise therapy can promote change in domains of self-esteem and psychopathologic outcomes. As such, it is important that knowledge is transferred on how best to conduct such protocols. The inclusion of screening for psychopathology in obese adolescents is also important. In the longer term, it is hoped that the principles of exercise therapy described within this thesis will contribute to the treatment of obesity and subsequently positively impact the lives of obese children and adolescents.

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APPENDIX 1

LETTER OF INVITATION TO ATTEND THE STUDY

Direct Dial +44 (0) 114 225 5635
Direct Fax +44 (0) 114 225 4341
Email r.j.copeland@shu.ac.uk

The Parent or Guardian of
x

Dear Sir/Madam

Re: The Sheffield Children's Exercise and Well-Being Project

I have been given your child's name by Dr Neil Wright from the Sheffield Children's Hospital.

Sheffield Hallam University and the Sheffield Children's Hospital are jointly running a Children's Exercise and Well-Being Project and are hoping that young people in Sheffield who have concerns about their weight will become involved in the project and find it worthwhile.

I have included an information sheet for you and your child, and if you are interested in your child becoming involved in the project please contact me on 0114 225 5635 or return the tear off slip below.

In the meantime, if you have any questions, or would like to know more about the project, please contact me on the number above.

Yours sincerely

Rob Copeland BSc MMedSci



Name of Child _____ Tel No _____

Parents Signature _____

(Please delete as appropriate) I am **interested/not interested** in my child taking part in the Sheffield Children's Exercise and Well-Being Project.

APPENDIX 2

PARTICIPANT INFORMATION SHEETS

The Sheffield Children's Exercise and Well-being Project

Parents and Guardians Information Sheet

Version 1: 25th October 2001

Your child is being invited to take part in a research project. But before you decide whether you would like your child to participate it is important for you to understand why the research is being conducted, the benefits to taking part and what it will involve for you and your child. Please take time to read the following information carefully and discuss it with friends, relatives and your GP if you wish. Feel free to ask us if there is anything that is not clear or if you would like more information. Take your time to decide whether or not you would like your child to take part.

Consumers for Ethics in Research (CERES) publish a leaflet entitled "Medical Research and You". This leaflet gives more information about medical research and considers some of the questions you may want to ask. A copy can be obtained from CERES, PO Box 1365, London, N16 0BW. In order to make sure that you have some general information about this study we have compiled a list of questions and answers. We hope that this will allow you to make an informed decision as to whether you would like your child to become involved in this project.

Q. What is the purpose of this study?

A. Being overweight can be a difficult experience for many young people. This research project will consider whether exercise can help young people who are overweight to feel better about themselves and help them to reduce their body fat. We hope that this study will provide health professionals with information regarding the usefulness of exercise therapy in young people who are overweight. Each child will be involved in the study for approximately 4 months and we will ask your child to visit us again for a follow-up assessment 3 months after they have completed the study.

Q. Why has your child been chosen?

A. In order for your child to take part in the study they must be aged 12-16 years, overweight and willing to attend supervised exercise or conditioning sessions 3 times per week for 8 weeks. We are hoping to recruit 126 young people from within South Yorkshire.

Q. Does your child have to take part?

A. Together, you and your child can decide whether you would like them to take part. If your child decides to take part you will be given this information sheet to keep and be asked to sign a consent form on behalf of your child. If your child does decide to take part they are still free to withdraw at any time and without giving a reason. This will not affect the standard of care your child receives.

Q. What will be involved if we agree to take part in the study?

A. Once the consent forms have been signed your child will be asked to participate in one of 3 groups. The requirements of each of these groups are outlined below. It is important to understand that all the children in the study will be allocated to one of the

3 groups in a random order. We have to do this in order to make sure the results scientific.

Over the course of the study we would like all the children (irrespective of which group they are in) to complete a series of questionnaires that will ask them to indicate their feelings about their body and general health as well as a walking assessment every four weeks. We will also need to use information on your child's pubertal status (as measured during their recent assessment at Sheffield Children's Hospital) to help us calculate their body mass accurately.

Group 1: Exercise therapy

The exercise sessions will take place within the Centre for Sport and Exercise Science (CSES) at Sheffield Hallam University outside of school hours. Your child will be offered a range of exercise types and asked to exercise at moderate intensity intermittently for 30 minutes 2 times per week for 8 weeks. The intermittent exercise will comprise of; (a) 4 minute warm up; (b) 4 x 4 minute exercise bouts with 2 minute rests in between each bout and; (c) 4 minute warm-down. All exercise sessions will be on a 'one-to-one' basis with an exercise specialist/researcher. Once your child has completed the supervised exercise therapy intervention they will be given an individualised home exercise programme and asked to continue exercising unsupervised 3 times per week for 6 weeks. Your child will wear a heart rate monitor throughout exercise.

An important feature of each exercise session will be exercise counselling. The exercise specialist will encourage participants to discuss their thoughts and feelings about exercise during these sessions.

If your child were to be allocated to Group 1 we would also like them to take part in 2 short interviews. These will be based around their personal experiences of exercise and their thoughts on the usefulness of exercise. Examples of the types of questions that you child will be asked listed below:

How was the exercise therapy for you?

What aspects did you enjoy and what things did you dislike"?

What things could have been improved?

Which exercise types did you like/dislike?

Group 2: Conditioning classes

Similar to the exercise therapy, the conditioning sessions will occur 3 times per week for 8 weeks and last for 60 minutes. Your child will be given a home-conditioning programme to follow once they have completed the 8-week conditioning intervention. The conditioning sessions will focus upon flexibility, body control, range of motion, stretching and posture through the use of a mini-circuit of exercises. Participants will be given a home-conditioning programme to follow once they have completed the 8-week supervised conditioning programme. Participants assigned to this condition will be asked to refrain from exercise for the duration of the study.

Group 3: Comparison Children

Children allocated to this group will not be involved with taking part in exercise or conditioning but will be asked to visit the Centre for Sport and Exercise Science for a walking assessment at various times throughout the duration of the study and to complete a series of questionnaires.

Q. What are the side effects?

A. Sometimes when children have not exercised for a long time they can experience shortness of breath during exercise and muscle soreness after exercise. If your child suffers from epilepsy, asthma or diabetes you should inform the exercise specialist before taking part in the study.

Q. What are the possible benefits of taking part?

A. Depending upon which group your child is allocated to they may be able to take part in supervised exercise or conditioning 3 times per week for 8 weeks and your child will be given additional help and guidance regarding their diet, health and lifestyle. The information we get from this study may help us to improve the health and well-being of other children who are overweight.

As your child will be asked to attend the Centre on several occasions throughout the course of this study and we will make a contribution of £2.50 per visit towards travel costs. Your child will also be given a £25 sports shop voucher for use towards equipment that may help them to be physically active at the end of their involvement in the study. Additionally, we will be offering your child the opportunity to take part in social events (e.g. ten pin bowling & cinema visits) once per month whilst they are taking part in the study.

Q. Can my child withdraw from the study at any time?

A. Yes your child can. They are free to withdraw at any time or choose not to answer certain questions. Your child will receive the same quality of care from the hospital whether your child joins the project or not.

Q. When and where will the exercise sessions take place?

A. All the exercise sessions will be based at the Centre for Sport and Exercise Science, Sheffield Hallam University outside of school hours. All exercise and conditioning sessions will be on a 'one-to-one' basis with an exercise/conditioning specialist.

Q. What other information will be collected in the study?

A. With your agreement, we may wish to obtain additional information about your child's treatment from their medical records. This would be done via the Sheffield Children's Hospital.

Q. What happens when the research stops?

A. Once your child has completed the 8 week exercise or conditioning programme they will be given an individualised unsupervised exercise programme to follow in their own time for 6 weeks. The project organiser will give you and your child help regarding this issue nearer the time.

Q. Will the information obtained in the study be confidential?

A. Anything you or your child says will be treated in confidence. No names will be mentioned in any reports of the study and care will be taken so your child cannot be identified from details in reports of the results of the study. With your agreement, we will inform your family doctor that your child is helping with this study.

Q. What will happen to the results of the research study?

A. We hope to publish the findings from this project in appropriate research journals. The data may also be presented at conferences.

Q. Who is organising and funding the research?

A. This project has been funded by the PPP Medical Healthcare Trust. The study will be conducted by The Centre for Sport and Exercise Science, Sheffield Hallam University, in conjunction with the Sheffield Children's Hospital.

Q. Who has reviewed the study?

A. The South Sheffield Local Research Ethics Committee has approved this study.

Q. What if I wish to complain about the way in which this study has been conducted

A. If you have any cause to complain about *any* aspect of the way in which you or your child have been approached or treated during the course of this study, the normal National Health Service complaints mechanisms are available to you and are not compromised in any way because you have taken part in this study.

If you have any complaints or concerns please contact Robert Copeland on 0114 225 5635. Otherwise you can use the normal hospital complaints procedure or contact Ms Gwyn Arnold, Registrar at Sheffield Hallam University on 0114 225 4022.

Thank you for taking the time to consider your participation in this study.

The Sheffield Children's Exercise and Well-being Project

Participants Information Sheet

Version 1: 25th October 2001

You are being invited to take part in a research project. But before you decide whether you would like to take part it is important for you to understand why the research is being conducted. It is important that you read this sheet and discuss it with your parents and friends. Please ask us if there is anything that is not clear or if you would like more information.

In order to make sure that you have some general information about this study we have compiled a list of questions and answers. We hope that this will allow you to make a decision as to whether you would like to become involved in this project.

Q. What is the purpose of this study?

A. This research project will consider whether exercise and conditioning can help you to feel better about yourself and become healthier. We hope that this study will provide doctors and other health professionals with information regarding the usefulness of exercise in young people. We are asking young people between 12-16 years to help us with our research.

Q. Why have you been chosen?

A. In order for you to be able to take part in the study you must be aged 12-16 years and willing to attend supervised exercise or conditioning sessions 3 times per week for 8 weeks. Some children will not be involved in exercise or conditioning but they will be asked to complete a series of questionnaires and a walking test on several occasions. We are hoping to recruit 126 young people from within South Yorkshire.

Q. Do you have to take part?

A. Along with your parents, you can decide whether you would like to take part. If you do decide to take part you will be given this information sheet to keep and your parents will be asked to complete a consent form. However, if you do decide to take part, you will still be free to withdraw at any time and without giving a reason.

Q. What will be involved if you agree to take part in the study?

A. Once you and your parent(s) or guardian(s) have signed the consent forms you will be asked to participate in one of 3 groups. The details of each of these groups are outlined below. It is important to understand that you will be allocated to one of the 3 groups in a random order.

Over the course of the study we would like you to complete a series of questionnaires that will ask you about how you feel. We will also measure your walking ability every 4 weeks. We would need you to be involved for approximately 4 months and we will ask you to visit us again for a follow-up assessment 3 months after you have completed the study.

1. Exercise Group

If you are allocated to the exercise group you will be asked to visit the Centre for Sport and Exercise Science (CSES) at Sheffield Hallam University outside of school hours. You will be offered a range of exercise types (e.g. walking, cycling and stepping) and asked to participate in moderate intensity physical activity for 30 minutes 3 times per week for 8 weeks. Your exercise sessions will be on a 'one-to-one' basis with an exercise specialist. No other people will be with you when you exercise. Once you have completed your 8-week exercise programme you will be given an individualised home exercise programme and asked to continue exercising in your own time 3 times per week for 6 weeks.

If you were allocated to the exercise group we would also like you to take part in 2 short interviews at the Centre. These will be based around your thoughts and feeling about the exercise sessions. Examples of the types of questions that you will be asked listed below:

How was the exercise therapy for you?

What aspects did you enjoy and what things did you dislike"?

What things could have been improved?

Which exercise types did you like/dislike?

2. Conditioning Group

The conditioning sessions will occur at the Centre 3 times per week for 8 weeks and last for 60 minutes. After you have completed your 8-week conditioning programme at the Centre you will be given a conditioning programme to follow on own. These sessions will involve gentle exercises and stretching.

3. Comparison Group

If you are allocated to this group you will not be involved with taking part in exercise or conditioning but will be asked to visit the Centre for a walking assessment and to complete a series of questionnaires at various times throughout the duration of the study.

Q. What are the side effects?

A. Sometimes when young people have not exercised for a long time they can experience shortness of breath during exercise and muscle soreness after exercise. If you suffer from epilepsy, asthma or diabetes you should inform the exercise specialist/researcher before taking part in the study.

Q. What are the possible benefits of taking part?

A. Depending upon which group you are assigned to you may be able to take part in supervised exercise or conditioning 3 times per week for 8 weeks. You may also be given additional help and guidance regarding your diet, health and lifestyle.

You will be given opportunities to participate in various social activities (e.g. ten pin bowling, cinema visits) once per month during your involvement in the study. You will also be given a £25 sports shop voucher for use towards equipment or clothing at the end of your first 8-weeks of involvement in the study. We will also contribute £2.50 per visit towards your travel expenses.

Q. When and where will the exercise sessions take place?

A. All the exercise sessions will be based at The Centre for Sport and Exercise Science, Sheffield Hallam University outside of school hours.

Q. What happens when the research stops?

A. Once you have completed your 8 week exercise or conditioning programme you will be given a personalised exercise or conditioning programme to follow on your own three per week for 6 weeks. The project organiser will give you more information about this nearer the time.

Q. Will the information obtained in the study be confidential?

A. Anything you say will be treated in confidence. Your name will not be mentioned in any reports of the study.

Q. Who is organising and funding the research?

A. The project has been funded by the PPP Medical Healthcare Trust. The study is being conducted by The Centre for Sport and Exercise Science, Sheffield Hallam University, in conjunction with Sheffield Children's Hospital.

Thank you for taking the time to consider your participation in this study.

APPENDIX 3

INFORMED CONSENT FORM

CONSENT FORM

Title of Project: Exercise and Well-being in Children

Name of Researcher: Robert Copeland

Please Initial box

1. I confirm that I have read and understood the information sheet dated for the above project and I have had the opportunity to ask questions.

2. I understand that my child's participation is voluntary and that I am free to withdraw my child at any time, without giving any reason, and without my medical and psychological care or legal rights being affected.

3. I understand that sections of my child's medical notes may be looked at by responsible individuals where it is relevant to their involvement in this project. I understand that the information will remain confidential.

4. I understand that my child's GP will be informed of their participation in this project.

5. I agree for my child to take part in the above project.

Name of Child/Patient Date Signature

Name of Parent or Guardian Date Signature

Name of Person taking consent
(if different from researcher) Date Signature

Researcher Date Signature

APPENDIX 4

RISK ASSESSMENTS

SHEFFIELD HALLAM UNIVERSITY
SCHOOL OF SPORT LEISURE AND MANAGEMENT

RISK ASSESSMENT PROFORMA

PROCEDURE: Exercise as a psychological therapy: The Relationship between Exercise and Mental Health in Clinically Obese Adolescents

ASSESSMENT No. RC/PPP/Out-line

DATE ASSESSED:

ASSESSED BY: Rob Copeland

SIGNED: **POSITION:** Researcher

<u>HAZARDS</u>	<u>RISKS AND SPECIFIC CONTROL MEASURES</u>
1. Cardio-vascular complications.	Medium: Extra strain is placed on the cardiovascular system when exercising. Control Measures: All activities are age-group specific. All patients to have medical clearance from Sheffield Childrens Hospital (SCH) prior to enrolment onto study. All exercise sessions to be undertaken in the presence of at least one trained first aider.
2. Musculoskeletal injury	Low: Extra demand is placed on the musculoskeletal system when performing physical activity. Control measures: pre-screening for old/existing injuries and a thorough warm up prior to exercise, all activities are age-group specific
3. Use of ergometers	Medium: Refer to CSES risk assessments on submaximal/maximal oxygen consumption on ergometers and motorised treadmills.
4. Use of Fitness equipment	Low: Extra demand is placed on the musculoskeletal and cardiovascular system whilst using fitness equipment (full list found below). Control measures: pre-assessment for old/existing injuries and a thorough warm up prior to exercise, all activities designed are age-group. Matted area provided.

RISK EVALUATION (OVERALL): Low/Medium

GENERAL CONTROL MEASURES

All subjects will undergo a familiarisation session prior to the start of the programme. Medical clearance must be obtained for **all** patients prior to enrolment onto the study. Medical supervision should be arranged for each initial assessment session. In addition, at least one first aider should be present at each assessment and each training session. Provision will be made to ensure maintenance of blood sugar levels: i.e. Dextrose tablets, Low fat energy bars, drinks etc. Water station present in lab. Matted area available for use with fitness equipment. All of the risk assessments referred to above must be adhered to.

EMERGENCY PROCEDURES

Initiate first aid response in accordance with training and agreed CSES procedures.

MONITORING PROCEDURES. All safety procedures to be monitored throughout the assessment and training sessions.

EQUIPMENT LIST

Polar Acurex Plus
LS770 Seca Heavy Duty Digital Floor Scales
NAiS BP Watch
LS220 Seca Telescopic Measuring Rod
LNP11 Acuflex 1 Sit and Reach Box
LSL245 Stop Watch
ABS REDO - Gym Ball 45cm
ABS REDO - Gym Ball 55cm
LPT40 PT Cross Trainer Trampet
Reebok Wgts 0.5 Kg
Reebok Wgts 1.0 Kg
Reebok Wgts 2.0 Kg
Reebok Wgts 3.0 Kg
LC11C Concept II Rower
Cateye T-220 Treadmill
The body Bar
Reebok Step
Reebok CYC6 Recumbent Cycle
Super Mini Trampoline
Sequencing Spots
Hands
Feet
Juggling Balls
Safety Dart Board
Pool Table

REVIEW PERIOD Annually

REVIEWED BY:

DATE:

SHEFFIELD HALLAM UNIVERSITY
SCHOOL OF SPORT AND LEISURE MANAGEMENT

RISK ASSESSMENT PROFORMA

PROCEDURE: Submaximal exercise on a recumbent cycle. Subjects will exercise for a maximum period of 4x4 minutes at 40-59% heart rate reserve.

ASSESSMENT No.

DATE ASSESSED:

ASSESSED BY: Rob Copeland

SIGNED:

POSITION: Research Assistant

<u>HAZARDS</u>	<u>RISKS AND SPECIFIC CONTROL MEASURES</u>
1. Musculoskeletal injury	Low. Extra demand is placed on the Musculoskeletal system when performing physical activity. Control measures: pre-screening for old/existing injuries and a thorough warm up prior to exercise.
2. Cardiovascular complications	Medium. Extra strain is placed on the cardiovascular system when exercising. Control measures: pre-screening questionnaire to assess the subject's current level of exercise and status of health. At least one trained first aider to be present during the test.
3. Subject falling from the recumbent cycle	Low. A subject may be unfamiliar with riding a cycle ergometer. Control measures: allow the subject to become accustomed to riding a recumbent cycle.
4. Shoelaces becoming caught.	Low. Control measures: secure shoe laces and any loose clothing prior to exercise.

RISK EVALUATION (OVERALL) Low

GENERAL CONTROL MEASURES

1. Pre-screening health and fitness questionnaire. 2. Strict adherence to the agreed protocol which includes a warm up and warm down 3. Taping down of free wires/cords. 5. Shoelaces are to be secured. 6. Visual communication is maintained between the subject and the experimenter through out the exercise.

EMERGENCY PROCEDURES

1. Emergency first aid if the subject faints or experiences cardiovascular complications.
2. A spillage kit is always present to swab up sweat, saliva or vomit.

MONITORING PROCEDURES Continuously monitor throughout and after the exercise test

REVIEW PERIOD Annually

REVIEWED BY:

DATE:

SHEFFIELD HALLAM UNIVERSITY
SCHOOL OF SPORT AND LEISURE MANAGEMENT

RISK ASSESSMENT PROFORMA

PROCEDURE: Submaximal exercise on a motorised treadmill. Subject walks on treadmill at an intensity between 40-59% heart rate reserve for maximum period of 4x4 minutes

ASSESSMENT No.

DATE ASSESSED:

ASSESSED BY:

SIGNED:

POSITION:

<u>HAZARDS</u>	<u>RISKS AND SPECIFIC CONTROL MEASURES</u>
5. Musculoskeletal injury	Low. Extra demand is placed on the musculoskeletal system when performing physical activity. Control measures: pre-screening for old/existing injuries and a thorough warm up prior to exercise.
6. Cardiovascular complications	Medium Extra strain is placed on the cardiovascular system when exercising. Control measures: pre-screening questionnaire to assess the subject's current exercise habits and status of health. At least one first aider to be present during the test.
7. Subject stumbling from the treadmill	Low. A subject may be unaccustomed to using a treadmill. Control measures: allow the subject an accustomisation trial prior to the exercise session.

RISK EVALUATION (OVERALL) Low

CONTROL MEASURES

1. Pre-screening health and fitness questionnaire. 2. Strict adherence to the agreed protocol which includes a warm up and warm down 3. Taping down of free wires/cords. 4. Heart rate is continuously monitored to identify when the subject is exercising to specified intensity. 5. Visual communication is maintained between the subject and experimenter through out the test.

EMERGENCY PROCEDURES

- 2. Emergency first aid if the subject faints or experiences cardiovascular complications.
- 2. A spillage kit is always present to swab up sweat, saliva or vomit.

MONITORING PROCEDURES Continuously monitor throughout and after the exercise test

REVIEW PERIOD Annually

REVIEWED BY:

DATE:

SHEFFIELD HALLAM UNIVERSITY
SCHOOL OF SPORT AND LEISURE MANAGEMENT

RISK ASSESSMENT PROFORMA

PROCEDURE: A test of maximal oxygen consumption. The subject's heart rate and rating of perceived exertion are continuously monitored while they exercise to volitional exhaustion on a motorised treadmill. Treadmill speed is increased every minute until the participant can no longer continue. Protocol appropriate for population

ASSESSMENT No.

DATE ASSESSED:

ASSESSED BY:

SIGNED:

POSITION:

<u>HAZARDS</u>	<u>RISKS AND SPECIFIC CONTROL MEASURES</u>
1. Musculoskeletal injury	Low. Extra demand is placed on the musculoskeletal system when performing physical activity. Control measures: pre-screening for old/existing injuries and a thorough warm up prior to exercise.
2. Cardiovascular complication	Medium. Extra strain is placed on the cardiovascular system when exercising. Control measures: pre-screening questionnaire to assess the subject's current exercise habits and status of health. At least one trained first aider to be present during the test.
3. Subject vomiting	Medium. When exercising maximally a subject may vomit. Control measures: A bucket and spillage kit are present to collect any vomit and clean any spillage.
4. Subject fainting or feeling nauseous	Medium. When exercising maximally a subject may feel faint/nauseous. Control measures: the subject is asked through out the test how they feel, if they feel faint or ill the test is stopped.
5. Subject stumbling from the treadmill	Medium. A subject may be unaccustomed to using a treadmill. Also the subject will be walking at high gradients towards the end of the test as they are becoming fatigued. Control measures: allow the subject an familiarisation trial before the exercise test. Exercise practitioner will be present at all times.

RISK EVALUATION (OVERALL) Medium

GENERAL CONTROL MEASURES

1. Pre-screening health and fitness questionnaire. 2. Strict adherence to the agreed protocol which includes a warm up and warm down 3. Taping down of free wires/cords. 4. The subject is monitored by a person trained in first aid once they have finished the test. 5. Heart rate is continuously monitored to identify when the subject is exercising maximally. 6. Visual communication is maintained between the subject and experimenter through out the exercise test. 7. Shoe laces are secured. 8. Have at least two people conducting the exercise test.

EMERGENCY PROCEDURES

3. Emergency first aid if the subject faints or experiences cardiovascular complications.
2. A spillage kit is always present to swab up sweat, saliva or vomit.

MONITORING PROCEDURES Continuously monitor through out and after the exercise test

REVIEW PERIOD Annually

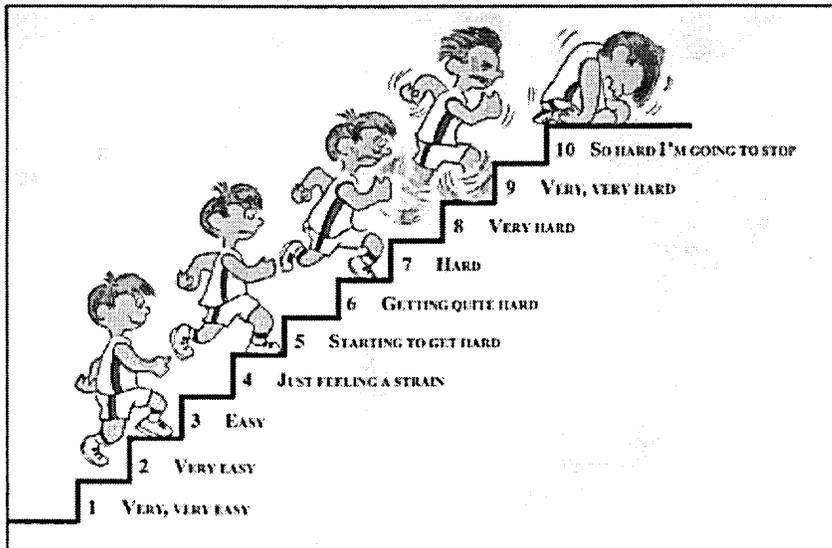
REVIEWED BY:

DATE:

APPENDIX 5

RPE FAMILIARISATION INSTRUCTIONS

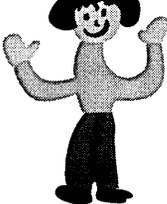
While walking on the treadmill we are going to ask you to rate your perception of exertion using the PCERT scale that is on the wall in front of you.



What 'rating your perceived exertion' means simply is; how heavy and strenuous does the exercise feel to you? Try not to underestimate or overestimate your feelings of exertion; be as accurate as you can. We are only interested in **your** feelings of exertion so try not to think about or be influenced by how others might rate their effort. We are going to ask you to provide two scores for perceived exertion. Firstly, we would like you to reflect upon your degree of breathlessness (basically how out of breath you are) and secondly describe as best you can specific feelings that relate to any muscular ache or pain that you experience in your legs. Using the scale in front of you imagine that a score of 1 is as though you were stood still and a score of 10 represents an activity where you are exercising so hard you are going to have to stop. Choose a number that best describes your level of exertion. Does this make sense? Can you explain to us what it is that is expected of you?

APPENDIX 6

QUESTIONNAIRE BOOKLET



Physical Activity Questionnaire for

Name: _____

Age _____

Sex: M _____ F _____

Year _____

Form Tutor: _____

We are trying to find out your level of physical activity from **the last 7 days** (in the last week). This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breath hard, like tick/tag, skipping, running, climbing and others.

Remember:

- a There are no right and wrong answers - this is not a test
- b Please answer all the questions as honestly and accurately as you can - this is very important

1 Physical activity in your spare time:
 Have you done any of the following activities in the past 7 days (last week)?
 If yes, how many times? (Tick **only one box per row**)

	No	1-2	3-4	5-6	7+
Skipping					
Rowing/Canoeing					
Roller Bladeing/Skating					
Tick/Tag					
Walking for Exercise					
Cycling					
Jogging or Running					
Aerobics					
Swimming					
Rounders					
Dancing					
American Football					
Badminton					
Skateboarding					
Football					
Hockey					
Volleyball					
Ice Skating					
Rugby					
Tennis					
Other:					
.....					

2 In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running jumping throwing)? (Tick **one only**)

I don't do PE	
Hardly ever	
Sometimes	
Quite often	
Always	

3 In the last 7 days, what did you normally **do at lunchtime** (besides eat lunch)?
(Tick one only)

- Sat down (talking, reading, doing schoolwork)
- Stood around or walked around
- Ran or played a little bit
- Ran or played quite a lot
- Ran or played hard most of the time

4 In the last 7 days, on how many days **right after school**, did you play sport, dance or play games in which you were very active (Tick one only)

- None
- Once last week
- Twice or three times last week
- 4 times last week
- 5 times last week

5 In the last 7 days, on how many **evenings**, did you play sport, dance or play games in which you were very active (Tick one only)

- None
- Once last week
- 2 or 3 times last week
- 4 times last week
- 6 or 7 times last week

6 On your **last weekend** how many times, did you play sport, dance or play games in which you were very active (Tick one only)

- None
- Once
- 2-3 times
- 4-5 times
- 6 or more times

7 Which one of the following describes you best for the last 7 days?
Read **all five** statements before deciding on the **one** answer that describes you best

- a All or most of my free time was spent doing things that involve little physical effort
- b I sometimes (1-2 times last week) did physical things in my free time (e.g. played sport, went running, swimming, cycling, did aerobics).
.....
- c I often (3-4 times last week) did physical things in my free time
- d I quite often (5-6 times last week) did physical things in my free time
- e I very often (7 or more times last week) did physical things in my free time

8 Mark how often you did physical activity (e.g. played sport, games, danced, or any other physical activity) for each day last week. (Tick only one box per row)

	None	Little bit	Medium	Often	Very Often
Monday	<input type="checkbox"/>				
Tuesday	<input type="checkbox"/>				
Wednesday	<input type="checkbox"/>				
Thursday	<input type="checkbox"/>				
Friday	<input type="checkbox"/>				
Saturday	<input type="checkbox"/>				
Sunday	<input type="checkbox"/>				

9 Were you ill last week, or did you do anything other than doing your normal physical activities?
(Tick one only)

Yes

No

If yes, what prevented you?

.....

.....



Physical Activity Questionnaire

Please let us know what exercise you do and how you feel about exercise. A lot of young people do not participate in much exercise and would like to participate in more. This is not a test. We would just like to find out how physically active you are at the moment.

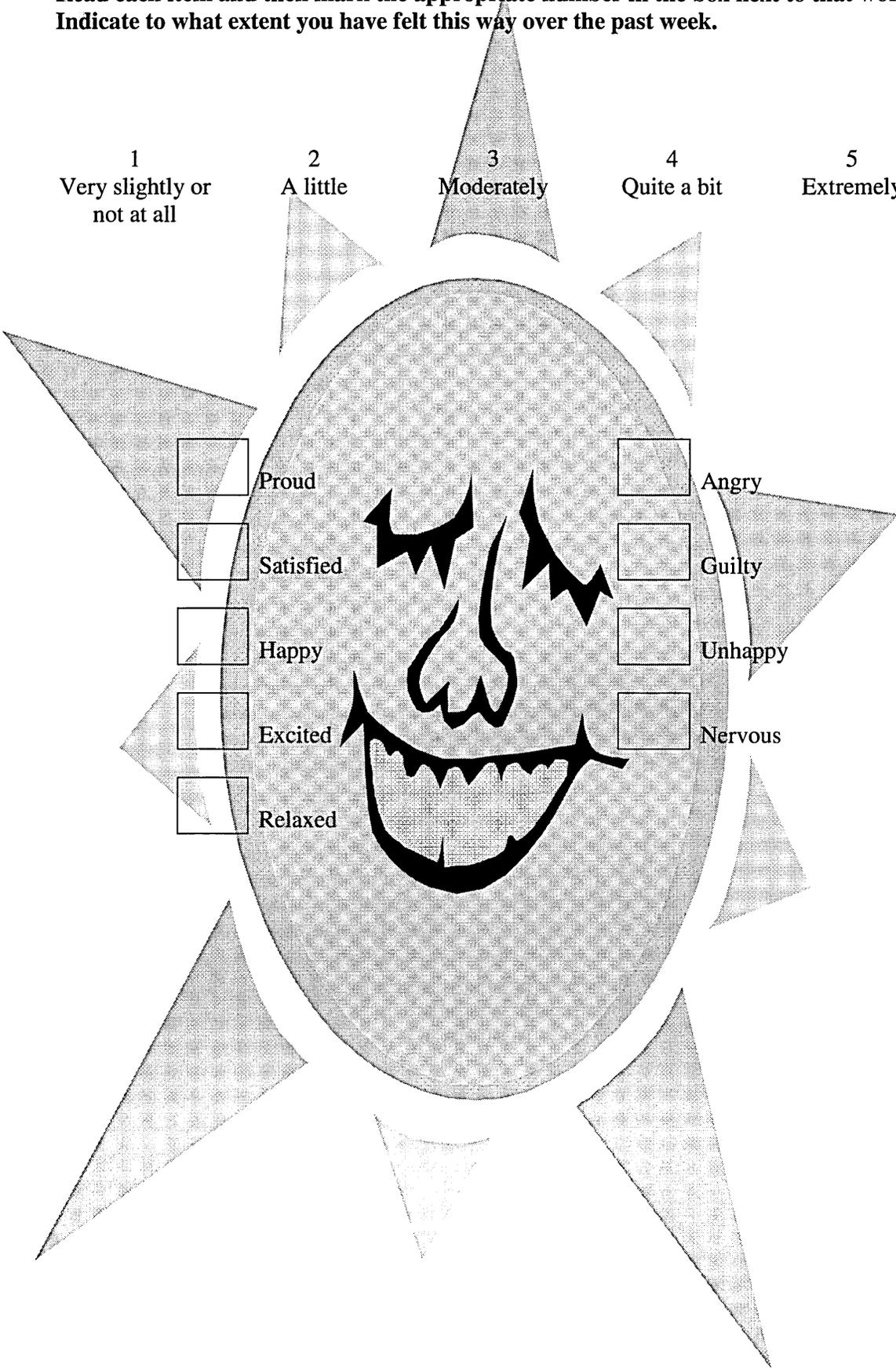
Circle the number on the ladder that best describes your levels of activity. Please answer this question as honestly as you can.

*Regular exercise = three or more times per week for 20 minutes or longer of moderate exercise e.g. walking briskly or cycling, swimming.

10	I exercise regularly* and have done so for longer than 6 months.
9	
8	I exercise regularly* but have done so for less than 6 months.
7	
6	I currently exercise some, but not regularly.*
5	
4	I have exercised in the past 6 months but have not done so recently.
3	
2	I currently don't exercise but I am thinking about starting in the next 6 months.
1	
0	I currently don't exercise and I do not intend to start in the next 6 months.

Below you will see a number of words that describe different feelings and emotions. Read each item and then mark the appropriate number in the box next to that word. Indicate to what extent you have felt this way over the past week.

1 Very slightly or not at all 2 A little 3 Moderately 4 Quite a bit 5 Extremely



Proud

Angry

Satisfied

Guilty

Happy

Unhappy

Excited

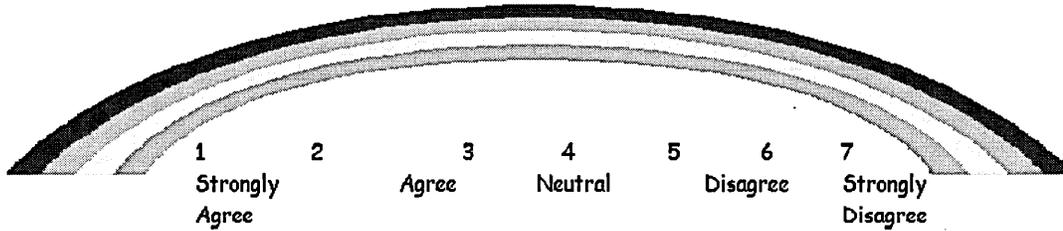
Nervous

Relaxed

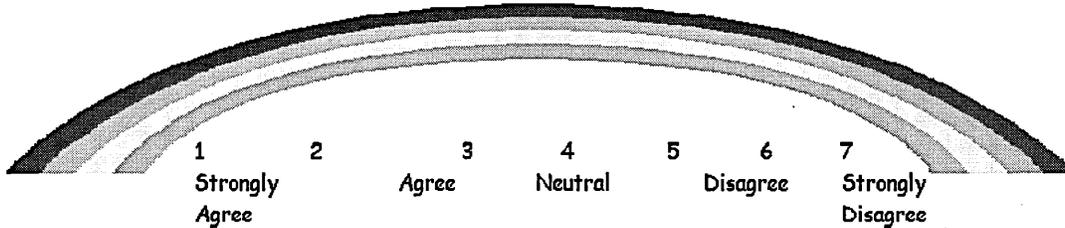
Your Thoughts About Physical Exercise

Please indicate by circling a number, how much you agree or disagree with each of the sentences below. This is not a test. Please answer this question as honestly as you can.

1. I would like to participate in physical activity at least 3 times per week every week



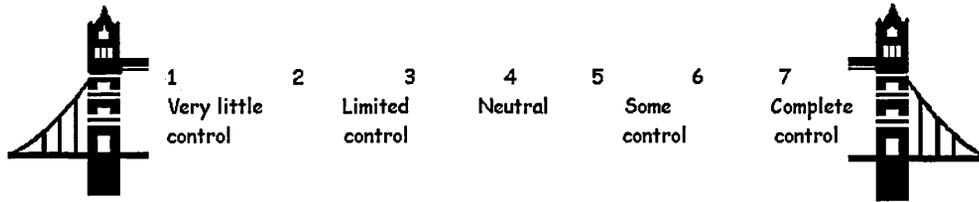
2. I am going to take part in physical exercise as much as I can every week



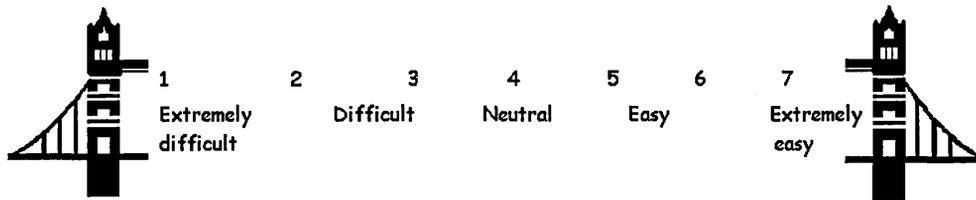
3. I plan to take part in physical exercise at least ____ times per week

Please indicate by circling a number, the best answer to the following the sentences below. This is not a test. Please answer the questions as honestly as you can.

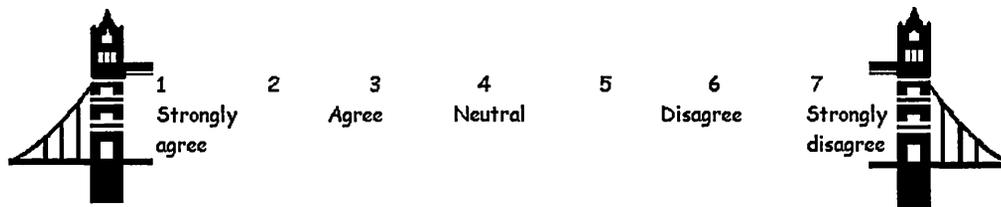
1. Is it always up to you when it comes to taking part in physical exercise



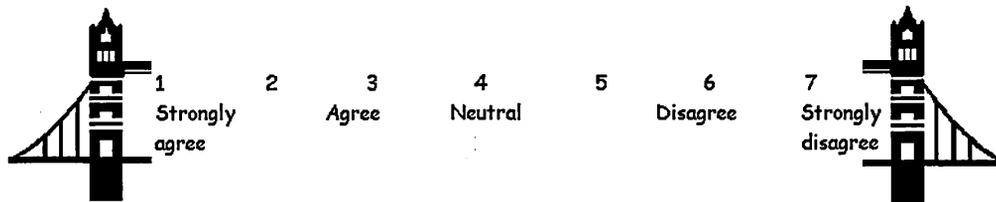
2. For you to take part in physical exercise is



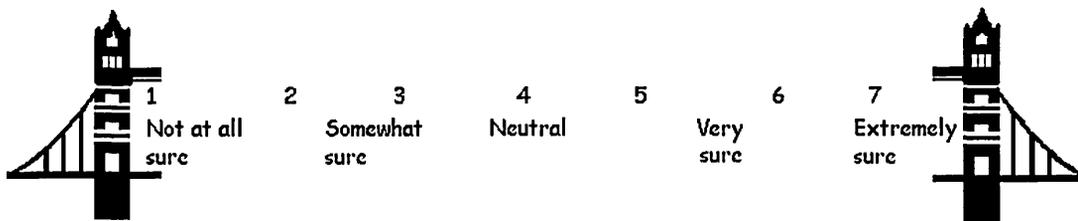
3. If I wanted to, I could easily take part in regular physical exercise



4. How much physical exercise I take part in is completely up to me

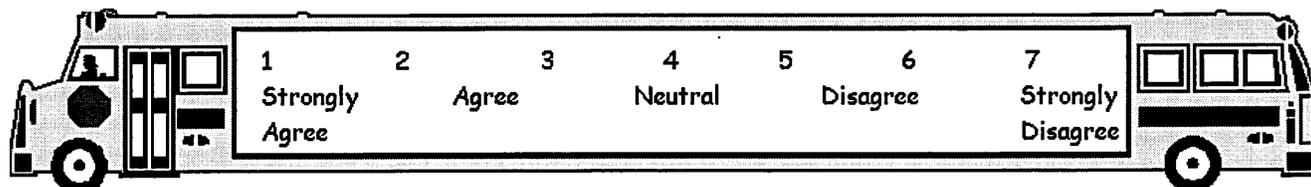


5. How sure are you that you are able to take part in regular physical exercise

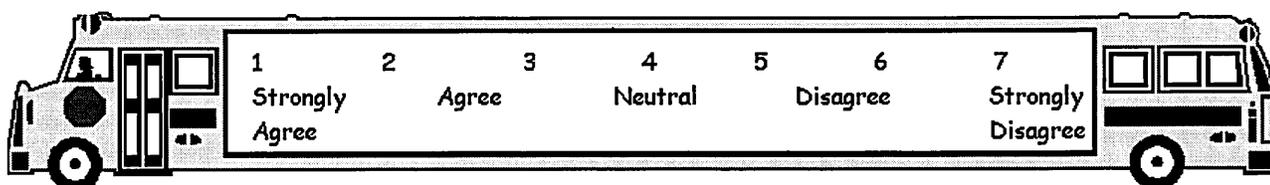


Please indicate by circling a number, how much you agree or disagree with the sentences below. This is not a test. Please answer the questions as honestly as you can.

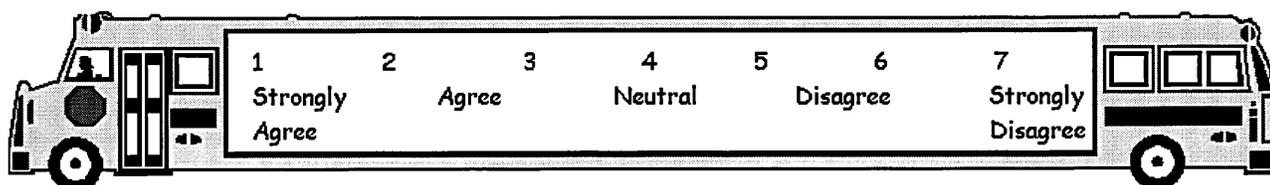
1. Most people who are important to me, think that I should take part in regular physical exercise



2. Most people who are important to me encourage me to participate in regular physical exercise



3. Most people who are important to me support me participating in regular physical exercise



Your Feelings about Exercise Participation.

Please consider the statement below, then for each scale, choose one score that best describes your feeling about exercise participation.

For me to participate in regular physical exercise is:

Useless							Useful
-3	-2	-1	0	+1	+2		+3

Write your score here_____

harmful							beneficial
-3	-2	-1	0	+1	+2		+3

Write your score here_____

foolish							wise
-3	-2	-1	0	+1	+2		+3

Write your score here_____

bad							good
-3	-2	-1	0	+1	+2		+3

Write your score here_____

un-enjoyable							enjoyable
-3	-2	-1	0	+1	+2		+3

Write your score here_____

unpleasant							pleasant
-3	-2	-1	0	+1	+2		+3

Write your score here_____

stressful							relaxing
-3	-2	-1	0	+1	+2		+3

Write your score here_____

WHAT AM I LIKE - 1

	Really True for me	Sort of True for me	SAMPLE SENTENCE		Sort of True for me	Really True for me	
a			Some kids would rather play outdoors in their spare time	BUT	Other kids would rather watch TV		
1			Some kids do very well at all kinds of sports	BUT	Other kids don't feel they are very good when it comes to sports		
2			Some kids feel uneasy when it comes to vigorous physical exercise	BUT	Other kids feel confident when it comes to vigorous physical exercise		
3			Some kids feel that they have a good looking (fit looking) body compared to other kids	BUT	Other kids feel that compared to most, their body doesn't look so good		
4			Some kids feel that they lack strength compared to other kids their age	BUT	Other kids feel that they are stronger than other kids their age		
5			Some kids are proud of themselves physically	BUT	Other kids don't have much to be proud of physically		
6			Some kids are often unhappy with themselves	BUT	Other kids are pretty pleased with themselves		
7			Some kids wish they could be a lot better at sports	BUT	Other kids feel that they are good enough at sports		
8			Some kids have a lot of physical stamina for vigorous physical exercise	BUT	Other kids soon get out of breath and have to slow down or quit		
9			Some kids find it difficult to keep their bodies looking good physically	BUT	Other kids find it easy to keep their bodies looking good physically		
10			Some kids think that they have stronger muscles than other kids their age	BUT	Other kids think that they have weaker muscles than other kids their age		
11			Some kids don't feel very confident about themselves physically	BUT	Other kids don't feel good about themselves physically		
12			Some kids are happy with themselves as a person	BUT	Other kids are often not happy with themselves as a person		
13			Some kids think they could do well at just about any new sports activity they haven't tried before	BUT	Other kids are afraid they might not do well at sports they haven't ever tried		
14			Some kids don't have much stamina and fitness	BUT	Other kids have lots of stamina and fitness		
15			Some kids are pleased with the appearance of their bodies	BUT	Other kids wish that their bodies looked in better shape physically		
16			Some kids lack confidence when it comes to strength activities	BUT	Other kids are very confident when it comes to strength activities		

	Really True for me	Sort of True for me			Sort of True for me	Really True for me	
17			Some kids are very satisfied with themselves physically	BUT	Other kids are often dissatisfied with themselves physically		
18			Some kids don't like the way they are leading their life	BUT	Other kids do like the way they are leading their life		
19			In games and sports some kids usually watch instead	BUT	Other kids usually play rather than watch		
20			Some kids try to take part in energetic physical exercise when ever they can	BUT	Other kids try to avoid doing energetic exercise if they can		
21			Some kids feel that they are often admired for their good looking bodies	BUT	Other kids feel that they are seldom admired for the way their bodies look		
22			When strong muscles are needed, some kids are the first to step forward	BUT	Other kids are the last to step forward when strong muscles are needed		
23			Some kids are unhappy with how they are and what they can do physically	BUT	Other kids are happy with how they are and what then can do physically		
24			Some kids like the kind of person they are	BUT	Other kids often wish they were someone else		
25			Some kids feel that they are better then others their age at sports	BUT	Other kids don't feel they can play as well		
26			Some kids soon have to quit running and exercising because they get tired	BUT	Other kids can run and do exercises for a long time without getting tired		
27			Some kids are confident about how their bodies look physically	BUT	Other kids feel uneasy about how their bodies look physically		
28			Some kids feel that they are not as good as others when physical strength is needed	BUT	Other kids feel that they are among the best when physical strength is needed		
29			Some kids have a positive feeling about themselves physically	BUT	Other kids feel somewhat negative about themselves physically		
30			Some kids are very unhappy being the way they are	BUT	Other kids wish they were different		
31			Some kids don't do well at new outdoor games	BUT	Other kids are good at new games right away		
32			When it comes to activities like running, some kids are able to keep going	BUT	Other kids soon have to quit and rest		
33			Some kids don't like how their bodies look physically	BUT	Other kids are pleased with how their bodies look physically		
34			Some kids think that they are strong, and have good muscles compared to other kids their age	BUT	Other kids think that they are weaker and don't have such good muscles as other kids their age		
35			Some kids wish that they could feel better about themselves physically	BUT	Other kids always seem to feel good about themselves physically		
36			Some kids are not very happy with the way they do a lot of things	BUT	Other kids think the way they do things is fine		

WHAT AM I LIKE - 2

	Really True for me	Sort of True for me			Sort of True for me	Really True for me	
1			Some teenagers feel they are just as smart as others their age	BUT	Other teenagers aren't so sure and wonder if they are as smart		
2			Some teenagers find it hard to make friends	BUT	For other teenagers it's pretty easy		
3			Some teenagers are often disappointed with themselves	BUT	Other teenagers are pretty pleased with themselves		
4			Some teenagers are pretty slow in finishing their school work	BUT	Other teenagers can do their work more quickly		
5			Some teenagers have a lot of friends	BUT	Other teenagers don't have many friends		
6			Some teenagers don't like the way they are leading their life	BUT	Other teenagers do like the way they are leading their life		
7			Some teenagers do very well with their class work	BUT	Other teenagers don't do very well with their class work		
8			Some teenagers are kind of hard to like	BUT	Other teenagers are really easy to like		
9			Some teenagers are happy with themselves most of the time	BUT	Other teenagers are often not happy with themselves		
10			Some teenagers have trouble figuring out the answers in school	BUT	Other teenagers can almost always figure out the answers		
11			Some teenagers are popular with others their age	BUT	Other teenagers are not very popular		
12			Some teenagers like the kind of person they are	BUT	Other teenagers often wish they were someone else		
13			Some teenagers feel that they are pretty intelligent	BUT	Other teenagers question whether they are intelligent		
14			Some teenagers feel that they are socially accepted	BUT	Other teenagers wished that more people their age accepted them		
15			Some teenagers are very happy being the way they are	BUT	Other teenagers wish they were different		

APPENDIX 7

DETAILED OUTLINE OF MINI GAMES

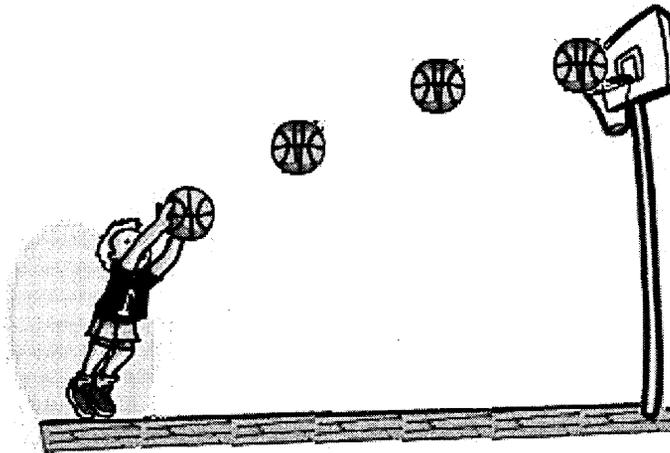
Shooting the basket

Aim.

To throw a basketball through a hoop (referred to in the exercise therapy sessions as 'shooting a basket') as many times as possible in one minute.

Description of task.

The participant stands on a coloured marker approximately six feet from the basketball hoop. Using whatever technique they feel most comfortable with (i.e. under arm or over arm, one handed or two handed) the participant attempts to throw the basketball through the hoop as shown below.



The participant has five practice throws. They are then timed for one minute and the number of successful baskets is recorded. The game is repeated and the participant's highest score is recorded. Throughout the game, the exercise practitioner/therapist stands next to the basketball hoop to catch/retrieve the ball and return it to the participant. The exercise practitioner/therapist is also responsible for timing.

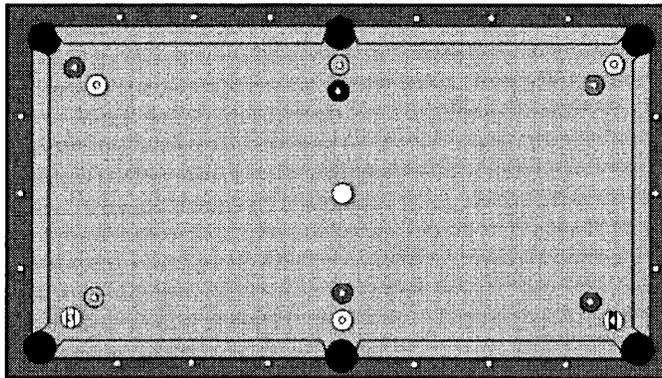
Pot the pool balls

Aim.

To pot all the pool balls on the pool table in as quick a time as possible. Normal pool rules apply.

Description of task:

The exercise practitioner/therapist places 12 coloured pool balls around the pool table as shown below. The colour of the balls is unimportant. However, it is important that the two balls placed as close to the edge of the pockets as possible.



The participant is then asked to pot all the pool balls as quick as quick as possible, up to a limit of two minutes. Thereafter, any remaining balls incur a five second penalty, which is added to participant's time. The game is then repeated and participant's quickest time is recorded. Throughout the game normal pool rules apply in that the white ball must be used to strike the pool ball(s) into a pocket using the cue. The participant cannot simply push each of the coloured pool balls into the pocket using the cue. The exercise practitioner/therapist can advise the participant on shot selection throughout. When required participants' received instructions on how to hold the cue and aim correctly. Participants were also given opportunity throughout the exercise therapy sessions to practice their technique (this generally took place after the aerobic exercise period and before the commencement of the mini games).

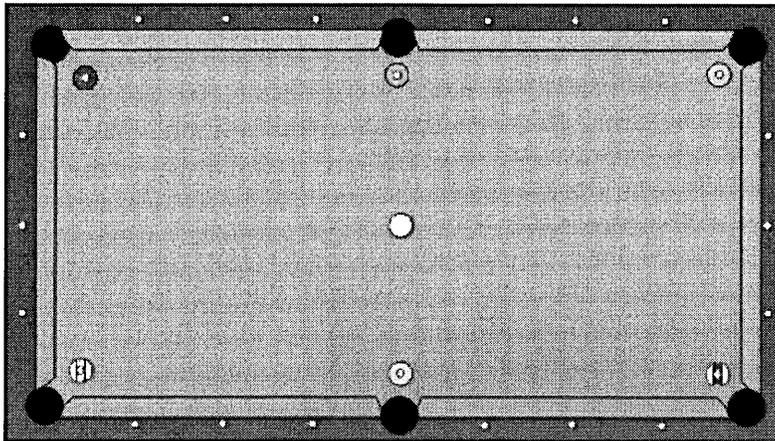
Shoot a hoop then pot a ball

Aim.

To shoot six baskets and pot six pool balls in as quick a time as possible.

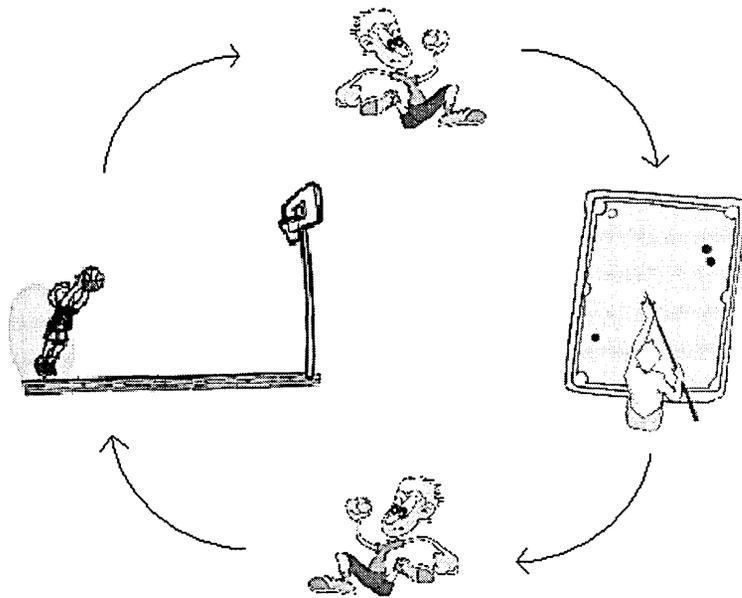
Description of task:

The exercise practitioner/therapist places six coloured pool balls around the pool table as shown below. The colour of the balls is unimportant but they should be placed as close to the edge of the pockets as possible.

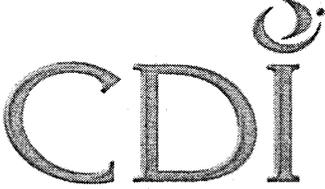


The participant begins the game standing on a coloured marker approximately six feet from the basketball hoop. Using whatever technique they feel most comfortable with (i.e. under arm or over arm, one handed or two handed) the participant attempts to throw the basketball through the hoop. Once the participant has successfully thrown the basketball through the hoop they then run over to the pool table and attempt to pot a pool ball. Normal pool rules apply, that is, the white ball must be used to strike a pool ball into the pocket using the cue. The participant cannot simply push each of the coloured pool balls into the pocket using the cue. After a successful pot, the

participant runs back over to the coloured marker to attempt to shoot another basket. This process is repeated until all the pool balls have been potted. In total, the participant shoots six baskets and pots six pool balls. The participant cannot pot a pool ball until they have successfully shot a basket. The game is repeated and the participant's quickest time is recorded. The mini game sequence is depicted below.



The exercise practitioner/therapist is responsible for timing, basketball retrieval and ensuring that the participant successfully shoots a basket each time before attempting to pot a pool ball.

Client ID: _____		by Maria Kovacs, Ph.D.
Age: _____ Birthdate: _____ <small>mm dd yyyy</small>		
Grade: _____ Gender: Male Female		
Today's date: _____ <small>mm dd yyyy</small>		

Kids sometimes have different feelings and ideas.

This form lists the feelings and ideas in groups. From each group of three sentences, pick one sentence that describes you *best* for the past two weeks. After you pick a sentence from the first group, go on to the next group.

There is no right or wrong answer. Just pick the sentence that best describes the way you have been recently. Put a mark like this next to your answer. Put the mark in the box next to the sentence that you pick.

Here is an example of how this form works. Try it. Put a mark next to the sentence that describes you *best*.

Example:

- | |
|---|
| <input type="checkbox"/> I read books all the time.
<input type="checkbox"/> I read books once in a while.
<input type="checkbox"/> I never read books. |
|---|

Remember, pick out the sentences that describe you best in the PAST TWO WEEKS.

<p>Item 1</p> <input type="checkbox"/> I am sad once in a while. <input type="checkbox"/> I am sad many times. <input type="checkbox"/> I am sad all the time.	<p>Item 6</p> <input type="checkbox"/> I think about bad things happening to me once in a while. <input type="checkbox"/> I worry that bad things will happen to me. <input type="checkbox"/> I am sure that terrible things will happen to me.
<p>Item 2</p> <input type="checkbox"/> Nothing will ever work out for me. <input type="checkbox"/> I am not sure if things will work out for me. <input type="checkbox"/> Things will work out for me O.K.	<p>Item 7</p> <input type="checkbox"/> I hate myself. <input type="checkbox"/> I do not like myself. <input type="checkbox"/> I like myself.
<p>Item 3</p> <input type="checkbox"/> I do most things O.K. <input type="checkbox"/> I do many things wrong. <input type="checkbox"/> I do everything wrong.	<p>Item 8</p> <input type="checkbox"/> All bad things are my fault. <input type="checkbox"/> Many bad things are my fault. <input type="checkbox"/> Bad things are not usually my fault.
<p>Item 4</p> <input type="checkbox"/> I have fun in many things. <input type="checkbox"/> I have fun in some things. <input type="checkbox"/> Nothing is fun at all.	<p>Item 9</p> <input type="checkbox"/> I do not think about killing myself. <input type="checkbox"/> I think about killing myself but I would not do it. <input type="checkbox"/> I want to kill myself.
<p>Item 5</p> <input type="checkbox"/> I am bad all the time. <input type="checkbox"/> I am bad many times. <input type="checkbox"/> I am bad once in a while.	

Turn over and fill out the other side.

Remember, pick out the sentences that describe you best in the past two weeks.

Item 10

- I feel like crying every day.
- I feel like crying many days.
- I feel like crying once in a while.

Item 19

- I do not worry about aches and pains.
- I worry about aches and pains many times.
- I worry about aches and pains all the time.

Item 11

- Things bother me all the time.
- Things bother me many times.
- Things bother me once in a while.

Item 20

- I do not feel alone.
- I feel alone many times.
- I feel alone all the time.

Item 12

- I like being with people.
- I do not like being with people many times.
- I do not want to be with people at all.

Item 21

- I never have fun at school.
- I have fun at school only once in a while.
- I have fun at school many times.

Item 13

- I cannot make up my mind about things.
- It is hard to make up my mind about things.
- I make up my mind about things easily.

Item 22

- I have plenty of friends.
- I have some friends but I wish I had more.
- I do not have any friends.

Item 14

- I look O.K.
- There are some bad things about my looks.
- I look ugly.

Item 23

- My schoolwork is alright.
- My schoolwork is not as good as before.
- I do very badly in subjects I used to be good in.

Item 15

- I have to push myself all the time to do my schoolwork.
- I have to push myself many times to do my schoolwork.
- Doing schoolwork is not a big problem.

Item 24

- I can never be as good as other kids.
- I can be as good as other kids if I want to.
- I am just as good as other kids.

Item 16

- I have trouble sleeping every night.
- I have trouble sleeping many nights.
- I sleep pretty well.

Item 25

- Nobody really loves me.
- I am not sure if anybody loves me.
- I am sure that somebody loves me.

Item 17

- I am tired once in a while.
- I am tired many days.
- I am tired all the time.

Item 26

- I usually do what I am told.
- I do not do what I am told most times.
- I never do what I am told.

Item 18

- Most days I do not feel like eating.
- Many days I do not feel like eating.
- I eat pretty well.

Item 27

- I get along with people.
- I get into fights many times.
- I get into fights all the time.

APPENDIX 9

STANDARD DIETARY ADVICE SHEET

Your Healthy Eating Plan Ideas for meals

Breakfast

Fruit or pure fruit juice
Breakfast cereal (whole grain is better), such as wheat biscuits, or bran flakes
Or wholemeal toast (use a polyunsaturated low fat spread)

Midmorning Snack

A piece of fruit
Or packet lower fat crisps e.g. French Fries or Twiglets
Or ready to eat dried fruit e.g. apricots, raisins or sultanas

Mid-day (packed lunch)

A sandwich preferably made with wholemeal bread, use lean meat or low fat cheese (such as Edam or cottage) use plenty of salad to bulk it up. *Try not to put spread on the bread.*
Packet lower fat crisps e.g. French Fries or Twiglets
Low fat yoghurt

Mid-day Alternative

Or a jacket potato beans, tuna or cottage cheese are all great fillings try not put butter in as well
Finish it off with a low fat yoghurt

Mid afternoon Snack

A piece of fruit
Or packet lower fat crisps e.g. French Fries or Twiglets
Or ready to eat dried fruit e.g. apricots, raisins or sultanas

Evening Meal

Lean meat, fish, or beans
Pasta, rice or potato
Vegetables and salad
Low fat yoghurt

The most important thing about healthy eating is to enjoy your Food

Produced by Nigel Mitchell BSc SRD, R.Pub.Nut

**'Be Cool With Your
Fuel'
Healthy Eating For
Young People**



So you want to be 'healthy' your diet is a good place to start, however diet is just one part of health you need to think about other life style things as well such as exercise.



For further information contact
Rob Copeland 0114 2255635

Healthy eating

To successfully follow a healthy diet it is important that you want to be healthy. A healthy diet may help you to lose weight. Healthy eating is also good for the rest of the family.

Basically there are three main targets that you will have to achieve to be more healthy; namely:-

- Changing eating habits
- Changing/reducing the types of food consumed
- Adequate activity levels

Eat regularly

Meal frequency - a structured eating plan will help to ensure that you do not become too hungry and therefore leading to overeating on high fat/sugary snacks. Eating regular meals is essential to ensure that your brain receives enough energy in order to help you concentrate, therefore missing meals must be avoided (see the menu ideas for suggestions).

Drinks

Try to avoid sugary drinks choose the sugar free option.

Portion sizes

need to be reduced we often eat larger amounts than we need. Reduce the portion of fatty/sugary foods and increase portions of fruit and vegetables and starchy foods to ensure a well balanced meal.

Energy and Calories

we think of energy and activity, in fact we get all our energy from our food, and this energy is called 'calories'. We need enough calories to provide us with the energy we need to live, but if we have too many calories we store the extra as body fat (like a camel's hump). The energy comes from Fat, Carbohydrate and Protein

- **Fat** has the most calories and, therefore should be used sparingly as too much can make you overweight and can be bad for your heart. Food and snacks that are typically high in fat are, biscuits, pastry, cakes, chocolate, crisps, butter, pies and fried foods. We need to cut down on these foods

- **Starchy carbohydrates** such as bread, cereals, pasta and potatoes should provide the bulk of each meal as they help to provide a sense of fullness. These foods have less calories than fat however, it is important that they are not prepared or served with additional fat, e.g. butter or a creamy sauce fry potato to make chips. Fibre rich sources of carbohydrate such as wholemeal bread and cereals are great to make us feel full.
- **Protein** also provides energy as well as helping us to have strong muscles, you need to make sure that you are getting enough protein. Generally speaking people eat adequate protein therefore a small reduction in portion sizes will probably result in enough protein to meet requirements

Fruit and Vegetables 'give me 5 to stay alive'

Do you know we should all aim to have **5** portions of fruit and vegetables a day, from a variety of sources, i.e. fresh, frozen or tinned (in own natural juice).



School dinners can be made more healthy by trying to have less fatty foods i.e. pastry, fried foods. Puddings contain a lot of fat and sugar which can make you overweight. A simple alternative to school dinners can be to take a pack up (packed lunch).

Snacks and Break time - most people snack on occasions. It is important to recognise if you are hungry or just bored. Break time at school could prove to be tricky especially if everyone around you is having a snack. To help save money and so that you can also have a healthy snack why not try to take things from home e.g. fresh fruit, ready to eat dried fruit, toast thinly spread with usual spread or you could try marmite or reduced sugar jam, cereals and milk, breadsticks, carrot and celery sticks, low calorie yoghurt or fromage frais, plain microwave popcorn, sugar free jelly, sugar free chewing gum, glass of milk, 2 plain digestives, rich tea biscuits.

APPENDIX 10

HOME PROGRAMME GOAL SETTING SHEET

Sheffield Children's Exercise & Well Being Project

Home Programme

GOAL SETTING

The purpose of Goal setting is to provide you with a focus for your 6-week home programme. These goals will help to motivate you when exercise seems difficult and provide some direction when you run out of ideas or get bored and fed up.

You are to set 5 goals that you intend to achieve over the 6-week home programme. Think about the goals you set carefully and bear in mind the following:

Your Goals Should be: Specific
 Flexible
 Challenging to you BUT achievable

Goal Setting Table:

Goal	Attained (y/n)
1	
2	
3	
4	
5	

APPENDIX 11

HOME PROGRAMME EXERCISE DIARY

Sheffield Children's Exercise & Well Being Project

Exercise Diary:

Activities For Week 1	
Mon	Type of Exercise: Duration of Exercise: RPE:
Tues	Type of Exercise: Duration of Exercise: RPE:
Wed	Type of Exercise: Duration of Exercise: RPE:
Thurs	Type of Exercise: Duration of Exercise: RPE:
Fri	Type of Exercise: Duration of Exercise: RPE:
Sat	Type of Exercise: Duration of Exercise: RPE:
Sun	Type of Exercise: Duration of Exercise: RPE:

Activities For Week 2

Activities For Week 2	
Mon	Type of Exercise: Duration of Exercise: RPE:
Tues	Type of Exercise: Duration of Exercise: RPE:
Wed	Type of Exercise: Duration of Exercise: RPE:
Thurs	Type of Exercise: Duration of Exercise: RPE:
Fri	Type of Exercise: Duration of Exercise: RPE:
Sat	Type of Exercise: Duration of Exercise: RPE:
Sun	Type of Exercise: Duration of Exercise: RPE:

Activities For Week 3

Mon	Type of Exercise: Duration of Exercise: RPE:
Tues	Type of Exercise: Duration of Exercise: RPE:
Wed	Type of Exercise: Duration of Exercise: RPE:
Thurs	Type of Exercise: Duration of Exercise: RPE:
Fri	Type of Exercise: Duration of Exercise: RPE:
Sat	Type of Exercise: Duration of Exercise: RPE:
Sun	Type of Exercise: Duration of Exercise: RPE:

Activities For Week 4

Activities For Week 4	
Mon	Type of Exercise: Duration of Exercise: RPE:
Tues	Type of Exercise: Duration of Exercise: RPE:
Wed	Type of Exercise: Duration of Exercise: RPE:
Thurs	Type of Exercise: Duration of Exercise: RPE:
Fri	Type of Exercise: Duration of Exercise: RPE:
Sat	Type of Exercise: Duration of Exercise: RPE:
Sun	Type of Exercise: Duration of Exercise: RPE:

Activities For Week 5

Mon	Type of Exercise: Duration of Exercise: RPE:
Tues	Type of Exercise: Duration of Exercise: RPE:
Wed	Type of Exercise: Duration of Exercise: RPE:
Thurs	Type of Exercise: Duration of Exercise: RPE:
Fri	Type of Exercise: Duration of Exercise: RPE:
Sat	Type of Exercise: Duration of Exercise: RPE:
Sun	Type of Exercise: Duration of Exercise: RPE:

Activities For Week 6

Activities For Week 6	
Mon	Type of Exercise: Duration of Exercise: RPE:
Tues	Type of Exercise: Duration of Exercise: RPE:
Wed	Type of Exercise: Duration of Exercise: RPE:
Thurs	Type of Exercise: Duration of Exercise: RPE:
Fri	Type of Exercise: Duration of Exercise: RPE:
Sat	Type of Exercise: Duration of Exercise: RPE:
Sun	Type of Exercise: Duration of Exercise: RPE:

Signed:

Date:

APPENDIX 12

EIGHT-WEEK INTERVIEW GUIDE

Sheffield Children's Exercise and Well-Being Project

Eight-week follow up Interview schedule

Name

How have you found the exercise sessions at the Centre?

What did you particularly enjoy about exercising at the Centre?

What things didn't you like about exercising at the Centre?

What things stop you from taking part in exercise?

Do you enjoy exercise? What things do you enjoy the most? Can you give me some examples of the activities that you enjoyed the most at the Centre?

How do you feel during your exercise sessions at the Centre?

How do you feel after your exercise sessions at the Centre?

What would you change about your visits to the Centre?

Were the exercise sessions at the Centre something that you looked forward to or were they something that you tried to avoid?

Did you like the structure of the exercise programme? Was it fun or boring?

Did you like having a break between each exercise activity?

Did you find the exercise sessions useful? Did they help you to think about your health? What aspects of your health did they help you to think about?

Do you think that children who have weight concerns should be encouraged to take part in exercise?

Do you feel that you will be able to exercise on your own now that your weekly visit to the Centre have come to an end?

What do you think you might buy with your sports shop vouchers?

Was there any particular reason why you decided to become involved with the project?

What kept you coming here week after week?

What have you learnt about yourself from doing this project so far?

What have you found difficult about the programme?

Did you feel any different on the days that you exercised at the Centre? How did you feel on those days?

How do you feel about your body now that you have been involved with the project?

Did you find it useful to talk about your health with Rob during your exercise sessions at the Centre?

Sheffield Children's Exercise and Well-being Project:

14-week Follow up Interview schedule

1. How's things been going over the past couple of months?
2. Have you managed to do any exercise? What sorts of things have you been doing?
3. What do you enjoy about exercise?
4. What don't you like about exercise?
5. What sorts of things stop you from taking part in exercise?
6. Has it been difficult to exercise on your own without Rob? Do you feel able to exercise on your own now?
7. How did you find the exercise diary? Was it useful?
8. Do you think that children who have weight concerns should be encouraged to take part in exercise?
9. Do you think that you will be able to keep your exercise participation up?
10. What have you learnt about yourself from doing this project so far? Do you feel any different?
11. What have you found difficult about the programme so far?
12. Did you feel any different on the days that you exercised compared to days when you don't exercise? How did you feel on those days?
13. Do you worry about your weight? Is it something you think about a lot?
14. How do you feel about your body now that you have been involved with the project for some time?
15. Have you enjoyed being part of the Sheffield Exercise and Well-being Project? What have you enjoyed?
16. Do you think the project has been worthwhile? Has the project helped you to exercise more? What about other aspects of your health, do you feel a bit more aware of your health or not? Can you give me some examples?

APPENDIX 14

TRANSCRIBED EIGHT-WEEK INTERVIEW: EXAMPLE

Sheffield Children's Exercise and Well-Being Project Eight-week Follow up Interview

Participant 7

How have you found the exercise sessions at the Centre?

I've found it built up my stamina more, cos before I wasn't right good at doing things, but now I know what I can do, so it's helped my quite a lot actually.

So do you think you've changed at all since you've been coming?

I've been doing more at home, exercise wise. Yeah it has helped me quite a lot.

Ok, good.

What did you particularly enjoy about exercising at the Centre?

Everything, it was just, it was fun, it wasn't made hard, it was a challenge sometimes, but it was made fun for me to do. It wasn't like I'd get up in the morning and dread coming. Yeah I did like coming.

What about in particular, if you think back over the last 8 weeks, the things that you've done, what particular things or was it just literally everything was good, or was there anything that you thought "yeah, I really like that bit, that was good".

No I liked everything.

Any particular exercises in the room.

I do like the rowing machine.

Right.

I did like the rowing machine more than anything else, yeah. I did like coming.

Right ok.

What things didn't you like about exercising at the Centre?

There wasn't anything I didn't like about coming really.

What about particular exercises that you didn't like doing. You know you said you liked the rower. You know was there anything that you thought "I don't like doing that".

Er, no cos I like doing the sit ups and the walking machine, the treadmill, the bikes, so nothing really.

Right. Ok that's fine.

What things stop you from taking part in exercise?

If you think about out of coming here, you know, when you're with your friends or at school. Are there any barriers that get in the way of you taking part in exercise?

Things that make it difficult for you to do.

Er, there's one exercise at school that I don't always do. Athletics, the running one, but I do walk, my mum writes me a letter and I do walk it instead of running it, because I get out of breath and then I get ill so I have to go home. So mum doesn't see any point in me doing that and having to come home, so we'd rather me walk. Like when they do cross country, I usually walk the cross country track instead of running it, so that's the only one really, I do everything else at school.

Right. Ok.

Do you enjoy exercise? What things do you enjoy the most? Can you give me some examples of the activities that you enjoyed the most at the Centre?

Yeah, I enjoy ... the main ones that I like are rounders, which I like and netball, swimming and hockey, but there's not really anything I don't I dislike. But my favourite ones I'll do more, and tennis I like a lot as well.

Your mum horse rides doesn't she, do you do any horse riding?

Yeah, I do do horse riding, but I can't at the moment cos the horse is lame.

How do you feel during your exercise sessions at the Centre?

Do you feel terrible, do you feel great, do you feel no different, do you feel out of breath.

No, it's just, it's er.....

Do you think about how you feel when you exercise, or do you just do it.

I just do it, I just get on with what I've got to do and then afterwards just..... I will get out of breath sometimes, it's particularly on the bike, that's the worse one, but everything else I seem to be alright on.

Right, ok.

How do you feel after your exercise sessions at the Centre?

You know when you get back in the car, that nice car that I see you drive in three times a week, you know, do you feel tired, do you feel fatigued, do you feel happy, do you feel sad.

No, I just feel alright, I just feel normal when I go.

So you don't feel any different between coming here and going again.

A bit tired, but no more different, not much more different, just a bit more tired.

What would you change about your visits to the Centre?

If you were to do this again, obviously you're still involved, but if you were to do it again, what things would you change, what do you think we could do better?

Is there enough variety of activity, would you like more things to do.

No, the variety..., cos I get to choose what I want to do apart from the rowing machine and that. I can either do the sit ups or anything else. But no, it's quite a variety, so I don't think I would change anything actually.

So you're fairly satisfied.

Yes

Right, ok

Were the exercise sessions at the Centre something that you looked forward to or were they something that you tried to avoid?

Yes

You definitely looked forward to coming.

Yes

Right, ok

Did you like the structure of the exercise programme? Was it fun or boring?
You know the idea that you get four minutes and then you get a break, is that good.

Yeah, it was alright, cos if it had gone on longer then I think that wouldn't have been able to do everything properly.

Did you like having a break between each exercise activity?
What about the two minutes, was that long enough to catch your breath.

Yeah, cos you got to have a drink and then carry on.

Ok

Did you find the exercise sessions useful? Did they help you to think about your health?

Yeah, cos we were on about having breakfast, and Rob told me off because I didn't have it, but I've started having it now. And then Mark Gold was on about taking the donkeys for a walk, I've got two donkeys, and we were just saying that it would help me a lot more so I thought about it a lot more and it has helped me.

What aspects of your health did they help you to think about?

Exercise, more exercise now, than before.

Any other things? Do you think about your diet or what you eat?

Er, Yeah, cos we were on about breakfast and then we were just I read that sheet with the lunch and

The dietary sheet.

Yeah, I read through that. It says jacket potato and things, that's what I usually have for my dinner anyway, so I was just looking to see what I could change, and I have changed my dinner to pasta instead of a sandwich all the time. So it does change now.

Do you like pasta?

Yes

Right, ok

One of the reasons behind setting up this project was to help kids that perhaps are a little bit overweight, you know to get them to come and exercise.

Do you think that children who have weight concerns should be encouraged to take part in exercise?

Do you think that all the kids that have weight concerns should do this sort of thing, you think it's useful?

Yeah, cos it makes you look at it a different way to what you used to, cos some kids just think "Oh well it will go away", but some, there's some people wanting to help you, so yeah, I think it should encourage more people to come.

Right, ok.

Do you feel that you will be able to exercise on your own now that your weekly visit to the Centre have come to an end?

Now that you've been here for eight weeks, do you feel that you will be able to do this, obviously the next stage is to try and see how much you can do on your own and then come back again at the end of that. Do you think it's going to be hard to do that?

No, not really, because I've got like, I've got the dogs which I usually take a walk like once a week anyway. Then there's the donkeys which I take a walk as well. Er, what else do I do, my horse, but not at the moment. Er, and where I live, there's nowhere round me, so I have to walk to my friends, which is like down the hill and then through an estate, and I do that. I walk to school and walk home, when I go back to school I will be doing that.

Before, did your mum usually give you a lift, or have you always walked?

I've always walked.

Right, ok

So what about the actually exercises, the things that you've done here. Do you think you'll be able to do them more at school. You talked about walking round the track, do you think you'd be able to walk round quicker now that you've been here, or do you feel fitter.

Yeah. I think I'll be able, when I go back to school, I've only got one PE lesson a week though.

Cos it changes as you get older, Yeah.

Yeah, I've only got one.

What year are you in now?

Year 10. So I had, last year I had 3 PE lessons, but now it's only going to be one when I go back to school. But I think I will be able to join in with more things than what I did, cos I know I can do it now, before I didn't know. Because I've been here, then I know I can do more things.

Yeah, ok

What do you think you might buy with your sports shop vouchers?

Er, either buy some track suit bottoms, or buy a school bag. I've not decided which one yet. If I don't buy one I'm going to buy the other.

Obviously in terms of the project itself....., I mean if you mum ends up buying you the bag....., but the idea of the voucher is for you to get something that may encourage you to be active, you know, now that you're going to be exercising on your own. So I would encourage you to think about buying some track suit bottoms, because that something that would encourage you, or anything else that would encourage you to be more active. That's the idea of the voucher for all the kids, to say "well here's a little token for you to get new trainers or whatever people need so that they exercise on their own.

Was there any particular reason why you decided to become involved with the project?

Was there anything that made you think that it would be something that you would like to do.

I just wanted to see if it could help me, cos I think it was through the hospital, Yeah, they mentioned it to us and Gerry was on about it and he said he'd write to you and I just wanted to see what it was like and if it would help me and it has done, so it was alright.

What kept you coming here week after week?

What is it that get you out of bed or to come down here after school?

I don't know, it's cos it's fun. If it weren't fun then I don't think.... I'd be like "Oh got to go there". But at school, everyone will say are you coming out now and I say "I can't I've got to go to Sheffield", "Why?", "Because I've got to, well I haven't got to but I want to" and they'll say "Oh you're boring" and I'll say "No, but it's fun" so it doesn't bother me coming, I still come.

Did you miss any sessions, or did you manage to come to every one?

No, I came to every one.

Everyone one, excellent, well done.

What have you learnt about yourself from doing this project so far?

That I can do a lot more, I'm capable of a lot more than I thought I was.

Right, were you quite surprised by that?

Yeah, cos my grandma, she works at the children's hospital. She's just a cleaner, but she was talking to some people and they were on about it and she's told everyone about it and she says she's got to tell everybody because she's proud of me.

Yeah, excellent.

What have you found difficult about the programme?

Er, the self assessment things on the treadmill. Walking for a lot longer. But I think I've done better this time, I've got to 12½ minutes on it.

Excellent, well done. What did you get last time, can you remember.

I think it was 8 or 9.

So that's a 30% increase.

It was hot that day though, the last time. But I think I've done better this time, I'm sure I've done better this time than I did last time.

Ok, good

Did you feel any different on the days that you exercised at the Centre? How did you feel on those days?

Compared to the days when you don't come, when you think about how you feel about yourself and your moods and your self esteem, those sort of things. Do you feel any different

Er, when I've come here, I feel happy that I'm doing something to help myself, but when I'm at home it's like..... But having said that, when I'm at home, my mum does tell me to walk the dogs so it's like coming here, doing something, cos that's what we arranged, we'd come here and do the exercises and then go home when I weren't here and do something. So we'd still be doing something every day, so, but, when I come here it felt like I knew I was doing something for myself but when I'm at home it more like "Oh, I've got to take the dogs for a walk again".

So, it's a bit of a chore.

Yeah, like I say here it's cool to come, but at home it's just the dogs.

Do you see walking the dogs as exercise, or do you just see it as....

Taking the dogs a walk.

Right. Ok.

Well, it is exercise isn't it.

How do you feel about your body now that you have been involved with the project? Do you feel any different. Whether your weight has gone up or down. Think about how you feel about yourself, do you feel any different about that?

I feel better because I've done something. I know I can help myself more now. But no different really, just that I know that I can be able to do something now when I get back to school or whatever.

Ok

Did you find it useful to talk about your health with Rob during your exercise sessions at the Centre?

Yeah

You talked about different aspects being healthy, exercise and diet, all those sort of things.

Yeah

APPENDIX 15

TRANSCRIBED 14-WEEK INTERVIEW: EXAMPLE

Sheffield Children's Exercise and Well-being Project: Follow up Interview

Participant 6

17. How's things been going over the past couple of months?
Fine, absolutely fine.
18. Have you managed to do any exercise? What sorts of things have you been doing?
I've been on the treadmill and on the bikes and on the skiing machine, I've basically gone through most of them.
19. What do you enjoy about exercise?
I like it on the rowing machine because that, you know, works a lot of muscles - Hard going though isn't it? - Yeah but I like doing that.
20. What have you been doing in between not coming here and coming back today?
I've been doing walking, sit-ups. - Right, excellent - Gym and swimming.
21. So what sort of things do you enjoy, if anything, about exercise, what is it that you enjoy about it?
The feeling afterwards mainly, you feel a lot better about yourself and if you haven't done any you feel like you've got nothing done.
22. What don't you like about exercise?
Nothing really, it's like I don't particularly look forward to it, but then once I'm doing it I don't know why I wasn't. I feel fine about doing it.
23. So you don't know why you might not look forward to it? Is it a big version or is it tiredness
Making myself do it because I have been used to having my own free time and doing what I want, actually knowing I've got to do something, you know puts me off a bit, but once I'm doing it, it's fine..
24. What sorts of things stop you from taking part in exercise?
25. Has it been difficult to exercise on your own without Rob? Do you feel able to exercise on your own now?
I was keeping it up yeah, and it was fine but a lot of the time I had to really push myself, because you keep thinking I can do it in five minutes or I'll do it in an hour and you've got to make sure you do do it.
26. When you came here to see Rob, you were coming here, let's say two or three times a week, how often have you been able to do that on your own?
I've spread it out over each day and done like a little bit each day, rather than cram it all in at once, I've spread it out so it is not strenuous
27. Do you feel that you can exercise on your own now?
Yeah, I feel fine about doing that now.
28. How did you find the exercise diary? Was it useful?
That was fine, I mean I kept forgetting in the beginning, and I had to remember what I did a few days ago, but it was good because it showed me what I had actually been doing.
29. Did you look back in the diary?
I did look back because you think 'did I do it' you know you can't remember doing it, but i had done a lot more than what I thought I had.
30. Was it hard to keep up with the diary?

It was a little bit, but it wasn't too bad, it just took a couple of minutes, it didn't make me go out of my way to do it.

31. So do you think that it is a good idea for people to keep a diary?

Yes definitely.

32. What do you think you got out of keeping a diary of what you did?

It just showed me what I could do and what I was capable of doing, and it made me remember to do other things that I had not done.

33. Do you think that people who have weight concerns should be encouraged to take part in exercise?

Yes definitely, I mean it's a lot easier than just going on a simple diet and in the long run it's more effective you know, it gives you a better lifestyle not just the weight loss.

34. Do you think that you will be able to keep your exercise participation up?

Yeah definitely, now I'll be getting more money it means that I can go swimming more often and things like that.

35. What have you learnt about yourself from doing this project so far? Do you feel any different?

That I can do a lot more than I thought I could.

Most people that come are asked that question and that is the thing they say, 'I didn't realise that I can do a lot more than I actually can'. How does that make you feel?

A lot better about myself, you know it makes me confident, pushing yourself further each time and stuff like that. Like when I go swimming, every time I went I would step up the length but in the same amount of time and in the end it felt a lot better.

36. How have you found the project, has it been useful to come.

It showed me that I really do need to exercise.

37. Anything else that you have found useful, I mean Rob talked to you about things that it is important to eat.

Making sure that I had breakfast because a lot of the time I would just skip it, because I didn't have time or because I wasn't feeling like it in the morning. But I've made sure that I have had it and that is it healthy during the day, I've not felt as hungry.

38. What things is your weakness in terms of the foods that you eat?

Mainly savoury things like crisps and sandwiches, I could just live on sandwiches, but I'm not too bad with chocolate and things like that. But definitely like crisps.

In terms of crisps, crisps aren't too bad, but a lot of people think crisps are ok, but in actual fact crisps are higher in fat than chocolate, it is very saturated fat, so watch your crisps a little bit. The other thing about diet is that we do need fat in our diet, we need about 25 - 30% of what we eat to be fat, if they tell you you shouldn't be eating fat they are talking rubbish. You do need fat, you just need to manage it a little bit, and you can get fat from savoury things as well. It is just a case of thinking do I really need to eat that. If people tell you not to eat fat, don't believe them it's not true.

39. What have you found difficult about the programme so far? Anything in particular that you thought 'I find that really hard'.

No not really it was all within my abilities and stuff, so it was fine.

40. Did you feel any different on the days that you exercised compared to days when you don't exercise? How did you feel on those days?
41. Do you worry about your weight? Is it something you think about a lot?
Yeah
42. What things about your weight do you worry about?
Basically it's about the future. Like all off the health risks involved and I have to do something about it and so it's like getting on with it.
43. Do you think if you hadn't heard about the project you would have exercised?
I would probably have not exercised it something that I have always thought, I'll just diet instead. It worked out a lot better.
44. What were your initial thoughts when you first heard about the programme?
At first it was like, I wasn't keen on doing it, I have always thought exercise was too hard, but once I came and they said to us about it and things like that I was definitely wanting to do it then. I'm glad I did it.
45. So how many times a week did you manage to come?
About three times a week.
46. Do you feel different about your body now?
I do yeah, it's definitely changed shape.
47. Have you enjoyed being part of the Sheffield Exercise and Well-being Project?
What have you enjoyed?
48. Has the project helped you to exercise more? What about other aspects of your health, do you feel a bit more aware of your health or not? Can you give me some examples?
It's just that I make sure I have my breakfast and then when I do have my meals I make sure it has plenty of salad and plenty of vegetables rather than, you know, just a little bit on the side. I make sure that it is more balanced and that I'm getting the right things.
49. Do you think the project has been worthwhile? Looking towards the future, what do you see in terms of exercise and diet? Is it something that you can maintain on your own?
Yeah, I will definitely keep it up, I mean my parents, when I go walking with my dad with the dog, and I go with both my mum and dad swimming. So they're encouraging about it so I don't feel like I'm the only one, kind of working on my own.
36. What did you spend your money on?
I actually gave it to my dad so he could buy a new computer.

I think that based on what you have said you have done really well you know, you've managed to come here, and to do it and it's hard to take up new things particularly if you are a little bit overweight, people do feel anxious it is not an easy thing to do, but you've done it, you've managed to come three times a week, you're thinking about your diet, you're still doing it now, so I think you've done really well. The key thing obviously is to really try and think about doing it all the time to the point when you don't have to think about it anymore it just becomes natural and that takes time. And the key thing as well is that obviously weight takes time to come off, so you've just got to persevere really. If you are eating the right food and you are exercising it is true that you will lose weight, you've just got to be patient, so don't expect too much too soon, obviously we want gradual changes over time. What will happen now is that you will come back in three months and then we'll review things and see how you're

going and then we'll have a chat about what you've been doing and then we'll sort of set you off. We are definitely in this for the long term and we want to encourage you to see things like that as well and don't get disheartened if you end up not exercising, you know we all get tired and don't want to do it, but the key thing is to make gradual changes at the time and you'll be spot on. Alright?