



REPORT

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Children and Physical Activity: A Systematic Review of Barriers and Facilitators

The Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre) is part of the Social Science Research Unit, Institute of Education, University of London



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A searchable database which includes the studies reviewed in this report will be available on the EPPI-Centre website (<http://eppi.ioe.ac.uk>).

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PREFACE

Scope of this report

This systematic review describes the number, types and quality attributes of existing research studies on the barriers to, and facilitators of, physical activity amongst children aged 4 to 10. It synthesises the findings of a sub-set of these studies to assess what helps and what stops children taking part in physical activity over and above what they do in school physical education (PE) lessons. The review goes on to make suggestions as to how physical activity can be promoted and for future research.

There are many useful messages in this work for policy-makers, commissioners, practitioners and researchers who have a remit to promote or conduct research on physical activity amongst children. The key messages of this review may particularly help:

- health- and other service-providers to assess the evidence-base for delivering to children the preventive aspects of the National Service Framework for Coronary Heart Disease;
- schools, Local Education Authorities and health services involved in achieving the National Healthy School Standard for physical activity;
- schools, Local Education Authorities and health services involved in planning and developing interventions to promote safe and active travel to school;
- local authorities in developing interventions to create opportunities for participation in active recreation; and
- services to support the NHS commitment to involving the public in the development and delivery of services.

How to read this report

Because this review is a *systematic* review, and uses explicit and rigorous methods to synthesise the evidence in this topic area, the report is necessarily detailed. Complexity and length have also been increased because the review synthesises evidence from ‘qualitative’ research together with experimental evaluations of interventions, something that traditional systematic reviews do not do. Some readers will be interested in the whole review to get an overall picture of, not only the findings of the review, but also how we came to those findings. Others will want to be directed to the parts most relevant to their needs.

As a quick guide, readers who want ***detailed information on effective interventions and how to implement these*** (e.g. practitioners, service commissioners, policy specialists) may be most interested in chapter 5 (especially ‘which interventions are effective’ in section 5.4), and in chapter 7 which illustrates whether/how these interventions match children’s views on the barriers to, and facilitators of, their participation in physical activity. Readers interested in ***details of the views of children on physical activity and how it might be promoted*** (e.g. practitioners, service commissioners, policy specialist, researchers) may be most interested in reading chapter 6 (especially section 6.5) and chapter 7. Chapter 6 describes the findings of studies that elicit children’s views, while chapter 7 compares children’s views on physical activity promotion to the kinds of approaches that have been evaluated. Readers wanting ***guidance on the kinds of interventions they should be developing and testing further and why*** (e.g. practitioners, service commissioners, policy specialists, researchers, research commissioners) may be most interested in reading chapters 7, 8 and 9. Chapter 8 contains ***a discussion of how the findings of the review relate to current policy and practice in physical activity promotion. Examples of physical activity promotion not covered in the in-depth review*** can be found in chapter 3. Readers interested in ***guidance on how best to evaluate the effectiveness of physical activity promotion*** may be most interested in section 8.3 of chapter 8, and those whose concern is ***how best to involve children in the development of physical activity promotion*** will find section 8.3 of chapter 8 particularly relevant. Readers (e.g. researchers, research commissioners) whose brief includes ***details of the amount and quality*** of research conducted on the topic of children and physical activity may be most interested in chapters 3, 5 and 6. Finally, ***details about the methods used in this systematic review*** are given in chapters 2 and 4, with a reflection on the methods used in chapter 8.

EXECUTIVE SUMMARY

Background and aims

Physical activity promotion is high on the public health policy agenda in the UK. Evidence regarding increased prevalence of obesity amongst children in the UK is mounting. Available data on levels of physical activity amongst children and young people suggest that levels begin to decline as children reach their teenage years. Promoting physical activity amongst children is considered to be particularly important as it may help to prevent this decline and encourage life-long physical activity habits. There is some evidence to suggest that material and social context affect children's participation in physical activity, with lower levels of physical activity and higher levels of sedentary activity reported amongst groups considered to be 'socially excluded'. However little is known about how different social factors such as gender, social class and ethnicity interact, and about where and how to intervene successfully.

This report describes a systematic review aiming to survey what is known about the barriers to, and facilitators of, physical activity amongst children aged four to 10. It is the first of two concerned with children aged four to 10 years; the second will focus on healthy eating. Both these reviews bring together the findings of 'qualitative' as well as 'quantitative' research, a task which is rarely attempted within a systematic review.

Methods

The review was restricted to studies focused on children aged four to 10 years, and to those studies published in the English language. Literature searches of multiple sources were undertaken to identify relevant research. We sought evaluations of interventions to promote physical activity amongst children ('outcome evaluations') carried out in any country from around the world. We also sought 'non-intervention' research aiming to describe factors relating to children's physical activity participation in the UK; evaluations looking at the processes involved in implementing interventions to promote physical activity ('process evaluations'); and previous systematic reviews.

We carried out the review in two stages: a mapping and quality screening exercise which described the characteristics of all the relevant research we identified; and an in-depth review synthesizing the findings of a particular sub-set of studies. The narrower focus of the in-depth review, chosen in consultation with user groups, was on the barriers to, and facilitators of, children's participation in physical activity outside physical education (PE) lessons at school.

Findings

The searches produced a substantial amount of potentially relevant literature – 360 full text reports were retrieved after screening 8231 titles and abstracts. After

screening full reports, 149 met our inclusion criteria and were available within the relevant time frame. These described a total of 90 separate studies. Six of these were existing reviews. None of these six reviews duplicated the work described here: not one focused solely on children aged four to 10 years; their methodological quality was variable, and none made any systematic attempts to integrate the findings from both 'qualitative' and 'quantitative' research.

Just over two-thirds (69) of the 90 studies reported interventions. Schools were the most frequent sites for interventions, followed by homes and the community. Teachers, parents and health professionals provided the interventions. Most of the interventions focused on information provision and/or education, but many involved participation in physical activities alongside education in the classroom. Several interventions aimed to enhance children's learning about the health benefits of physical activity using bio-feedback techniques. Modifying children's environments was an infrequent intervention component. A trial design was the most commonly used evaluation strategy, even in the UK. Fifty-one of the 66 outcome evaluations used this approach, and 27 of these were randomised controlled trials (RCTs). All four outcome evaluations carried out in the UK used a trial design.

All of the 15 UK 'non-intervention' studies identified used a cross-sectional design, examining factors relating to children's participation in physical activity at one point in time. Their reporting of methods was highly variable. For example, no studies clearly described the ethnicity of the children in their sample and only four gave information about their socio-economic background.

Whilst there has been a substantial amount of evaluation activity related to promoting children's physical activity, little of this has been conducted in the UK. Other types of research in the UK on this topic and age group are similarly scarce. Only 22 of the 90 studies focused on groups of children at risk of social exclusion, and none of these studies were conducted in the UK.

Twenty-one of the 66 outcome evaluations met the criteria for in-depth review (aimed to promote physical activity beyond the PE lesson; measured relevant outcomes; and employed a trial design). The most common reasons why studies did not meet the in-depth criteria were a failure to employ a control or comparison group or a failure to measure relevant outcomes. Most of the 21 studies (n = 14) were conducted in the USA, with four in the UK and one each in Ireland, Greece and the Netherlands.

We judged five of the 21 outcome evaluations to be methodologically sound. All were conducted in the USA. The most common problem with those studies judged not to be sound was a failure to provide data describing the study groups prior to intervention.

The small number of sound studies and the diversity of the interventions evaluated in these made it difficult to detect any clear patterns related to intervention effectiveness. Two interventions attempted to change children's level of sedentary behaviour; three aimed to increase levels of participation in physical activity; all interventions involved parents, but to varying degrees; and all but one involved a school-based element.

The two studies evaluating interventions to decrease sedentary behaviour focused on reducing media use such as TV viewing and use of video games. Both of these are suggestive of positive effects on physical activity, on TV and video-related sedentary activity, or on both, but caution is needed in their interpretation. The first was a pilot study of a counselling and behavioural intervention aimed at reducing TV viewing among African American children aged seven to 12; the intervention was judged to be effective in increasing organised physical activity levels, but as a small pilot study it lacked sufficient statistical power reliably to show any effect. The second intervention study aimed at decreasing media use examined the effectiveness of school-based curriculum with a home component, and found this to be effective for a number of outcomes, including in reducing TV viewing time and video-game playing and the frequency of meals eaten in front of the TV. There was no evidence of an effect of this intervention on reported physical activity levels; the study may not have had sufficient power to detect such an effect.

The third sound outcome evaluation, the Child and Adolescent Trial for Cardiovascular Health ('CATCH'), evaluated a school-based intervention aiming to change children's eating habits, physical activity patterns and smoking uptake. The intervention involved health-related curricula taught by classroom teachers and changes to school meals and PE lessons. Half the intervention schools also had a home activity component. Vigorous physical activity was significantly higher in the intervention group. However, since results were not presented separately for the 'school only' and 'school and home' CATCH intervention groups, it was not clear what additional effect, if any, the components of CATCH involving families may have had on children's outcomes.

The fourth sound outcome evaluation detected positive effects on knowledge only. The 'Eat Well and Keep Moving' intervention evaluated the impact on children's diets, health-related knowledge, TV viewing and physical activity of a low cost, sustainable, school-based diet and physical activity programme among nine-year-old school children from low-income families. Intervention components included classroom education; home-based activities; and provision of low-cost facilities for parents. Although the intervention increased knowledge of physically healthy activities, there was no evidence of effect on behavioural measures.

The fifth sound outcome evaluation, the 'Know Your Body' programme, was a five-year school-based intervention aiming to promote nutrition and physical activity and prevent smoking amongst children aged nine years old living in the Bronx district of New York. The intervention included teacher-led classroom education, parental involvement activities, and risk factor examination. It was effective for increasing health knowledge only. There was no evidence that the bio-feedback of risk factors, which was a key part of the programme, was an effective approach, and it was considered to have created considerable disruption of regular school activities.

These five studies show that interventions can lead to positive changes. Education and provision of equipment for monitoring and reducing TV, video-tape and video-game use appear to be promising population-based approaches to promoting children's physical activity, as do multi-component interventions set in schools, homes and the wider community. However, it is not clear whether the latter type of intervention can be effective in changing behaviour, as the two studies testing this approach demonstrated changes in children's knowledge only

In-depth review: results from studies examining children's views

Studies of children's views about physical activity appear to be rare. The five studies we identified were difficult to find: four were identified only through searches on specialist health promotion registers and one was found through contact with the author.

All five studies examined children's views on what stopped them taking part in physical activity. These studies highlighted a total of 20 distinct but interrelated barriers. The 20 barriers clustered around three underlying themes: ***preferences and priorities*** (e.g. a preference for doing other things, a lack of spare time); ***family life and parental support*** (e.g. parents' lack of current participation in, or enthusiasm for, sports and exercise); ***restricted access to opportunities for participation*** in sport or exercise (e.g. cost, particularly for children from families with a low income; distance, particular for children from rural areas; lack of means for safe travel; lack of facilities) and participating in unstructured forms of physical activity (e.g. busy traffic; threat of crime; threat of intimidation by older children; and neglect of local play areas).

Four of the five studies also examined children's views about what helped them to take part in physical activity. A total of 14 distinct, but interrelated, facilitators were identified. Again, these clustered around particular themes: ***aspects of physical activity that children value*** (e.g. a choice of sporting and exercise opportunities; physical activity as a means to having fun and spending time with friends; for those children already engaged in high levels of sport, a sense of belonging to a team, enjoyment of competitiveness, and feelings of achievement); ***family life and parental support*** (e.g. a supportive, encouraging and inspiring family; provision of practical support by parents; the opportunity to do things with other family members); ***greater access to opportunities for participating in physical activity*** (e.g. owning a car; having a garden). Children and parents also identified five ideas for promoting physical activity, all of which emphasised the need to change children's local environments: better provision of youth clubs; cleaning up park spaces and play areas; providing better cycle paths; schools to provide more extra-curricular opportunities; and making school facilities more accessible outside of school lessons.

Our critical appraisal of these studies suggests that researchers need to develop the methods they use and report on them with greater clarity. Methods of analysis were particularly poorly described or absent and it was difficult for the reviewers to be confident that the study findings were really rooted in the children's perspectives. All but one of the studies failed to involve children actively in the design or conduct of the study.

Synthesis across study types

Our synthesis across intervention studies and studies of children's views found some important matches, but there were also significant mismatches between what children say influences their participation in physical activity and the barriers and facilitators addressed in soundly evaluated interventions. A major gap was the lack of soundly evaluated interventions addressing barriers identified in children's local environments.

Some aspects of children's views reflecting their **preferences, priorities and valued aspects of physical activity** do appear to have been built upon in interventions soundly evaluated and shown to be effective. Interventions which aimed to reduce the amount of time children spent watching TV or playing computer games in order to make more time available for physical activity were successful. Other interventions that match children's views, which have been developed but not yet adequately evaluated, include the provision of a tailored fitness module which matches children's activity preferences and the provision of opportunities to participate in simple activities in school-break times. Interventions emphasising the social, physical and mental benefits of physical activity valued by children need to be newly developed and evaluated.

In terms of children's views relating to **aspects of family life and parental support**, all the soundly evaluated interventions included a parental involvement component. These build on children's views that parental enthusiasm and support are important. However, none of the evaluations measured the impact of the interventions on parents themselves.

None of the soundly evaluated interventions built on children's views relating to **access to opportunities for participating** in physical activity. However, some interventions of this type have been developed, although they are still awaiting a sufficiently robust evaluation of their effectiveness. These include an intervention to provide free transportation to sports facilities; a UK study offering children free introductory sessions at local authority clubs and facilities; the provision of information about free opportunities for physical activity; making school facilities for physical activity available outside school hours; and another UK study evaluating a low-cost modification designed to improve the school playground. Interventions which need to be newly developed and evaluated include initiatives to clean up park spaces; reducing crime and the threat of crime in children's local environments; reducing busy traffic and improving cycle paths; and improving the provision of youth clubs as safe place for children to be active in all weathers.

Conclusions

This review found few evaluated health promotion interventions which address physical activity beyond the PE lesson, and even fewer that have been rigorously evaluated. Whilst children have clear views on the barriers to, and facilitators of, their participation in physical activity, their views rarely informed the development of interventions. There is little research to guide promoting physical activity amongst socially excluded children in the UK. Poor reporting of sample characteristics within studies compounds this problem.

Gaps between children's views and soundly evaluated interventions were most noticeable in relation to issues identified by children of restricted access to opportunities for physical activity (e.g. busy traffic, poor quality of playgrounds, and the need for local, easily accessible facilities).

In terms of recommendations for effective interventions, the following have been demonstrated to be effective in one or more studies: education and provision of equipment for monitoring TV or video-game use; engaging parents in supporting and encouraging their children's physical activity and providing opportunities for family participation; and multi-component, multi-site interventions using a combination of

education in the classroom, improvements in school PE, and home-based activities. However, the small number of sound evaluations found means that conclusions about effectiveness can only be tentative. It is not yet clear whether these types of interventions will always result in positive behavioural changes, which components are essential for success, or the extent to which they are appropriate for children in a UK context.

Approaches which appear to take into account the views of children in the UK, but which require further evaluation and development include those which: provide children with a diverse range of physical activities to choose from; emphasise the aspects of participating in physical activity that children value (e.g. opportunities to spend time with friends); provide free or low-cost transportation and reduce costs; and those which aim to provide a safer local environment in which children can actively travel and play.

Future evaluations need to involve researchers, practitioners, children and their parents working in partnership, and employ rigorous evaluation methods. Reporting of studies needs to include clear details of methods to facilitate replication. In order to assess whether interventions can reduce inequalities in children's participation in physical activity, it is particularly important that studies report sample characteristics.

AIMS

This report describes the methods and findings of a systematic review of research relevant to the barriers to, and facilitators of, physical activity amongst children aged four to 10. This review was commissioned by the Department of Health (England) to provide practitioners, policy-makers and researchers with a summary of evidence to help them plan interventions for children that are likely to be effective in bringing about sustainable behaviour change, and to identify future research needs.

The aims of the review were:

- to undertake a *systematic mapping* of research undertaken on the barriers to, and facilitators of, physical activity amongst children, especially those from socially excluded groups.
- to select a sub-set of studies to review *in-depth*.
- to *synthesise* what is known from these studies about physical activity barriers and facilitators amongst children.
- to identify gaps in existing research evidence.

This review will be followed by a similar review in the area of healthy eating. These two reviews build on, and extend, a recently completed series of reviews on the barriers to, and facilitators of, physical activity, healthy eating and good mental health amongst young people. These reviews have all been undertaken within the health promotion stream of work at the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre) at the Social Science Research Unit, Institute of Education, University of London.

In addition to producing substantive findings, these reviews also aim to advance methodology for integrating diverse study types, including 'qualitative' research, within systematic reviews of social interventions. A framework for achieving this was developed within the recently completed series (Harden *et al.*, 2001b; Rees *et al.*, 2001; Shepherd *et al.*, 2001), building on our previous attempts to include non-experimental studies in systematic reviews (Harden *et al.*, 2001a; Oliver *et al.*, 2001). This same framework is applied and refined in these two new reviews.

All this work builds on our earlier advances in systematic review methods for examining the evidence base for the effectiveness of health promotion (Oakley *et al.*, 1996b; Peersman *et al.*, 1998; Peersman *et al.*, 1996); see also (France-Dawson *et al.*, 1994; Oakley and Fullerton, 1994; Oakley and Fullerton, 1995; Oakley *et al.*, 1995a; Oakley *et al.*, 1995b; Oakley *et al.*, 1995c; Oakley *et al.*, 1994a; Oakley *et al.*, 1994b).

1. BACKGROUND

1.1 Why promote children's physical activity?

Physical activity has enormous potential for improving the health of the public (Sparling *et al.*, 2000). In adults, it has an important role in: reducing cardiovascular disease; preventing or delaying the development of high blood pressure; controlling and preventing diabetes; regulating weight; reducing the risk of osteoporosis and colon cancer; alleviating depression and anxiety; and contributing to a positive sense of well-being (Centers for Disease Control, 1997; Health Development Agency, 2000). For example, a recent systematic review of studies of adults (Wannamethee and Shaper, 2001) concluded that being physically active is associated with a 40 to 50 per cent reduction in the risk of a stroke and coronary heart disease.

The evidence for a positive association between physical activity amongst children and young people and their future health is weaker than for adults, but is still suggestive (Riddoch, 1998). In this age group physical activity has been linked to: improved aerobic endurance and muscular strength; positive changes in risk factors for cardiovascular disease such as body mass index (BMI), blood lipid profiles and blood pressure; increased bone density; higher levels of self-esteem; and lower levels of anxiety and stress (Centers for Disease Control, 1997).

Biddle and colleagues (2001) argue that, despite this weaker evidence, there is still a strong case for promoting children's participation in physical activity because of the key role this can play in the prevention and reduction of obesity. Evidence regarding the increased prevalence of obesity amongst children and young people in the UK is mounting (NHS Centre for Reviews and Dissemination, 2002). A recent study examined trends in weight and obesity among primary school children aged four to 11 years in England and Scotland using data from three cross-sectional studies carried out between 1974 and 1994 (Chinn and Rona, 2001). While the incidence of overweight and obesity as measured by body mass index remained stable between 1974 and 1984, there was a noticeable increase from 1984 to 1994. In addition, promoting physical activity in children is seen as important in encouraging them to adopt lifestyles which will be maintained into adulthood, thus lessening the risk of chronic diseases later in life (Biddle *et al.*, 2001).

Physical activity varies in intensity: light, moderate and vigorous. Moderate intensity is any activity done at a level which leaves the participant feeling warm and slightly out of breath, while vigorous intensity is 'expected to leave the participant feeling out of breath and sweaty' (Health Education Authority, 1998, p. 2). Many of the health benefits of physical activity occur with moderate to vigorous intensity exercise (Riddoch, 1998; Wannamethee and Shaper, 2001). Recent guidelines recommend that children and young people should participate in physical activity of at least moderate intensity for one hour per day (Biddle *et al.*, 2001). These recommendations are based on an 'accumulative' approach to physical activity as distinct from the 'sustained' approach of earlier guidelines which recommended three to five sessions of at least 20 minutes duration (Gilson *et al.*, 2001).

Epidemiological studies examining levels of physical activity amongst children and young people explore the extent to which these match the recommended levels, and vary according to gender and social class. In a review of 16 such studies from

around the world, Armstrong and Van Mechelen (1998) conclude that most children and young people satisfy the recommendation of accumulating at least 30 minutes of moderate intensity exercise per day, but few appear to engage in sustained periods of activity lasting at least 20 minutes. Other consistent patterns across studies revealed that boys were more physically active than girls, and that physical activity levels decline with age. These patterns are similar to those found in a recent survey in the UK. The National Diet and Nutrition Survey reports physical activity prevalence rates for a representative sample of 2672 young people aged 4 to 18 in 1997 in the UK (Gregory *et al.*, 2000). Nearly all children aged four to six were rated by their parents as 'fairly active' (53% for boys and 64% for girls) or 'very active' (43% for boys and 29% for girls). Whilst most children aged seven to ten met recommendations for participating in at least moderate physical activities for at least half an hour per day (90% of boys and 73% of girls), considerably fewer participated in one hour or more (70% of boys and 49% of girls). These proportions declined with age: in the 15 to 18 year group, only 44% of boys and 31% of girls were taking part in at least moderate physical activities for at least one hour per day. Some differences by social class were noted. Children and young people in households in receipt of benefits and boys from a manual social class background spent more time in sedentary activities. However, the robustness of the link between social class and physical activity is not yet clear. A recent review by Sallis and colleagues (2000) noted a lack of consistency in the findings of current studies.

It is also important to consider the opportunities children actually have for engaging in physical activity. A recent study of prevalence rates and opportunities for activity in and out of school was completed by Sport England in 2000 (Rowe and Champion, 2000). This reports findings from a random cross-sectional sample of children and young people aged 6 to 16 years; physical education (PE) teachers were also surveyed. The results are compared with those from a previous survey conducted in 1994. The 1999 study found that, while being physically active comes naturally to young children, over a third of 6 to 8 year olds were doing less than one hour PE per week. Teachers taking PE in primary schools usually did not have a specialist PE qualification, and there was little access to good quality sports facilities. The report raised specific concerns about declining levels of participation in swimming, particularly as learning to swim is an aspect of PE where there is a National Curriculum requirement. Children from disadvantaged backgrounds are most likely to be affected by this decline in PE curriculum time, since they are less likely to have the resources for extra-curricular physical activities.

The reduction in physical activity in schools is paralleled by fewer opportunities for physical activity elsewhere. Perceptions of risk are receiving greater attention and, whatever their views about the relative likelihood or risk, parents feel under increasing pressure to ensure their children's safety at all times (Harden *et al.*, 2000b). A study of children's use of urban space revealed children's and parent's perceptions of risk beyond the home as restricting children's activities (O'Brien *et al.*, 2000). The proportion of children walking to school has reduced dramatically since 1970. A comparison of inner city living with a newly developed satellite town revealed that children's freedom to get out and about (for example, by playing in the street, cycling on main roads, walking alone to a friend's house or going to the shopping centre) was greater where the population was less dense and green spaces were within easy reach of children's homes. Girls and children from minority ethnic communities are more restricted in their use of public space. Despite these restrictions, children value public outdoor places for meeting friends and retaining

some social autonomy away from the adult gaze; for the less affluent the street is the main social forum (Matthews *et al.*, 2000).

In response to increasing perceptions of risk, 'safe play' is increasingly offered by commercial playgrounds where parents can relax, socialise and supervise their children in comfort (McKendrick *et al.*, 2000). However, concerns about safe equipment and safe behaviour may be restricting the physical challenges for children here too.

1.2 What is physical activity?

Physical activity can be defined as 'any bodily movement produced by skeletal muscles that results in energy expenditure' (Caspersen *et al.*, 1985, p. 127). The term means more than 'exercise', 'sport' or 'PE'. Physical activity can take the form of walking, cycling, dancing, and doing active household chores as well as organised sports or exercise, and it can take place in a variety of settings, including homes, schools, parks, leisure centres, and bicycle or walking trails (Centers for Disease Control, 1997; Wannamethee and Shaper, 2001). The distinctions between exercise or sport, active recreation and active transport, and sedentary behaviour are likely to be important for examining the barriers to, and facilitators of, physical activity amongst children. This report uses the term 'physical activity' to encompass a broad range of activities. The terms 'sport', 'exercise', 'PE' and 'fitness' are used when appropriate, or when these are the terms used by the authors of studies referred to in the review.

1.3 Current policy initiatives to promote physical activity in children

The promotion of physical activity has high priority within the health policy agenda in the UK. *Our Healthier Nation*, the Government's strategy for health (Department of Health, 1998) identifies the aim of reducing the risk from chronic and preventable disease and promoting positive health across all population groups. *Saving Lives* (Department of Health, 1999a) set specific targets for the prevention of deaths from cancer, coronary heart disease, stroke, accidents and mental illness across all population groups, including children. Promoting healthy eating and physical activity are key goals because of the significant roles these can play in reducing the risk of coronary heart disease, cancer, stroke and diabetes, as well as promoting an overall sense of well-being.

In recognition that no one agency can be held solely responsible for promoting physical activity, the Department of Health (DoH) has taken the lead on a cross-government strategy. The National Audit Office (NAO) has undertaken a review of policies across government departments related to tackling obesity in order to identify current and future collaborative work (National Audit Office, 2000). This initiative has highlighted the importance of interlinking policy objectives across departments and subsequent cross-agency working at both national and local level. The interlinking objectives in which physical activity can play a part are:

- Reducing risk factors for coronary heart disease, cancer and stroke and inequalities in risk factors and promoting mental health for all (DoH).
- Encouraging walking and cycling and reducing reliance on cars (Department for Transport, Local Government and the Regions (DTLR)).
- Ensuring children achieve the skills, attitudes and personal qualities to give them a secure foundation for lifelong learning, work and citizenship; this includes health education and school environments which promote health (Department for Education and Skills (DfES)).
- Ensuring adequate opportunities for active recreation for all including socially disadvantaged groups (Department for Culture, Media and Sport (DCMS)).

Current health and wider government initiatives emphasise reducing inequalities and social exclusion (Acheson, 1998). This focus is in recognition of evidence that the homeless, the unemployed, the abused, the chronically ill, and ethnic minorities, amongst others, are all at elevated risk for ill-health. Standard one of the National Service Framework for Coronary Heart Disease identifies reducing coronary risk factors in the population, and inequalities in these factors, as a priority (Department of Health, 2000). Several initiatives are specifically targeted at the promotion of physical activity among children, and some of these aim to counteract risk factors arising from social exclusion. Many involve cross-agency working. These include the 'Healthy Schools Programme' and the 'National Healthy School Standard' run jointly by the DfES, and the DoH; 'Sports Action Zones', established in the most deprived areas by the DCMS and including proposals to refurbish school sports facilities and open these up to the wider community; and guidance produced by the DfES, the DoH and the DTLR for local authorities, schools and parents on building a safe environment for pupils to walk or cycle to school (National Audit Office, 2000).

These recommendations are reflected in specific policy initiatives for promoting physical activity. The focus is on creating opportunities for participation within children's schools and social environments, rather than solely on persuading children individually to become physically active.

1.4 Using research to inform physical activity promotion

This review aims to provide a synthesis of research on what is known about the barriers to, and facilitators of, physical activity among children.

Policy initiatives indicate a wide range of factors which are thought to hinder children from being physically active (barriers) or help them to be more so (facilitators). Research can help to illuminate such barriers and facilitators, addressing issues such as 'which facilitators are most important for which groups of children in which contexts?' and 'if interventions address barrier X, will the physical activity levels of children increase?' Research on barriers and facilitators can fall into one of two broad 'types':

- Studies aiming to describe the factors influencing children's participation in physical activity either positively or negatively; and

- Studies evaluating the effectiveness and appropriateness of interventions designed to promote children's physical activity.

Examples of studies in the first category are those which examine factors (e.g. age, social class, gender, attitudes) associated with children's participation in physical activity, and studies whose aim is to explain *how* these factors are related – for example, some may impact on children's participation in physical activity directly, and others may play a mediating role. Many of these studies examine children's or parents' views about what affects children's physical activity levels. Relevant research designs range from large-scale surveys and epidemiological analyses of large datasets, to 'qualitative' studies examining views through in-depth interviews or focus groups, or even illuminative techniques such as the 'draw and write' method (MacGregor *et al.*, 1998; McWhirter *et al.*, 2000).

Research relevant to illuminating barriers and facilitators has been conducted from a range of theoretical perspectives: psychological (with a focus on the role of an individual's motivation for taking part in physical activity); sociological (locating physical activity participation in the context of social relationships and the wider society); or pedagogical (examining the relationship between physical activity participation and the nature and purposes of PE and its place in the school curriculum). All these perspectives are helpful in reaching a thorough understanding of the barriers and facilitators relating to children's physical activity.

We found six previous systematic reviews relevant to children's participation in physical activity (Fulton *et al.*, 2001; Keays and Allison, 1995; Pender, 1998; Resnicow and Robinson, 1997; Sallis *et al.*, 2000; Stone *et al.*, 1998). These all include at least some studies which focus on children aged four to 10 years, although only one study referred to specific age ranges and presented age-specific results. All six reviews described their search strategies and inclusion criteria, but only one reported its methods of analysis (Resnicow and Robinson, 1997); one other study described methods of quality assessment and data extraction (Sallis *et al.*, 2000).

Three of these six previous systematic reviews examined the effectiveness of interventions in school settings (Keays and Allison, 1995; Resnicow and Robinson, 1997; Stone *et al.*, 1998), while two reviewed interventions in unspecified locations (Fulton *et al.*, 2001; Pender, 1998). One review focused solely on the correlates of physical activity (Sallis *et al.*, 2000), and one combined examination of correlates of physical activity with effectiveness of interventions to improve physical activity (Pender, 1998). Fulton and colleagues (2001) examined the evidence from weight loss treatment programmes and weight gain prevention trials to summarise research on how to prevent weight gain. Pender (1998) looked at the correlates of physical activity and at interventions to address these correlates. Resnicow and Robinson (1997) examined school-based cardiovascular disease prevention trials and physical activity.

All five of the systematic reviews examining interventions looked at combinations of diet and exercise interventions, and classroom-based curricula. Two studies also examined the impact of augmented physical education programmes (Keays and Allison, 1995; Stone *et al.*, 1998). The consensus of the five reviews was that multi-component interventions addressing physical activity as a component of dietary or 'lifestyle' strategies are effective in increasing knowledge and physical activity in

children and adolescents. Fulton and colleagues (2001) concluded that unstructured physical activities were likely to be more effective for sustained weight loss than structured exercises. In looking at correlates of physical activity, Pender (1998) noted the following as influential factors: biological variables (e.g. boys being more active than girls); ethnic background; behaviour-specific perceptions and attitudes (e.g. time constraints, lack of interest, school work, self-efficacy); parental influence; and environmental or situational influences (for example, facilities, equipment, and safe and pleasant surroundings). Sallis and colleagues (2000) also noted the importance of gender; whether or not parents are overweight; children's physical activity preferences and intentions; previous physical activity levels; diet; programme/facility access; and time spent outdoors.

None of the six previous systematic reviews examined research relating to exactly the same age range as this review. Those focused on children or young people concentrated on attempts to promote physical activity within school PE.

1.5 Some notes on research with children

The review by Sallis and colleagues (2000) of factors associated with children's participation in physical activity excluded studies which sought the views of children themselves. This is an important omission. Examining the views of research participants and service-users is crucial in the genesis of policy- and practice-relevant research findings (see e.g. Mayall and Foster, 1989; Oliver, 1997). The NHS is committed to considering the views of the public in the development and delivery of services (Department of Health, 1999b). As health is shaped by specific social, cultural and economic factors which need to be understood within the specific context of children's everyday lives, the most effective and appropriate strategies for promoting children's health are only likely to be developed when children's own views are considered (Brannen *et al.*, 1994; Moore and Kindness, 1998; Peersman, 1996; Shucksmith and Hendry, 1998). Hence the need to develop ways of understanding the sociology of childhood and child-relevant public policy based on the experiences of children themselves (McKendrick *et al.*, 2000), and across different sectors, for example home and school, traditionally separated in adult discourse about children (Edwards, 2001).

Research with, and for, children, especially young children, raises specific ethical and methodological issues. Traditionally, research has been done 'on' children, in line with a view of children's 'best interests', according to which judgements about children's welfare are not based on asking them what they want or need, but on what other people consider to be the case (Oakley, 1993). Hood and colleagues similarly note the 'welfarist' or 'developmental' underpinnings of research 'on' children, highlighting how children are predominantly constituted as a 'social problem', with the role of adults being defined as protecting and controlling them (Hood *et al.*, 1996, p.119). The distinction between research 'with' or 'for', rather than 'on', children has only very recently been made. The emergence of a 'sociology of childhood' (see e.g. Mayall, 2002) has led to new ways of thinking about research with children, challenging researchers to undertake research with children in the light of the same principles of respect they would use in working with other social groups.

Children constitute a social minority group, and childhood is a socially constructed category (James and Prout, 1997). Children, like other people, are able to contribute meaningful research data; their views or actions should not be judged in terms of

how these compare with some normative or 'adultist' perspective. Hood and colleagues (1996, p. 119) outline what they see as the implications of this for conducting research with children when the researcher(s) is/are adults. They argue that research with children should involve 'listening attentively to their agendas, and participating with them in the research process' and that research should be done explicitly 'for' children, as 'in the end the justification for the research – for "collecting the data" is to help make children heard'. Following ethical and methodological principles for research 'with' children means that: the research should be fully explained to children; attention should be paid to acknowledging and minimising the power relationships arising from differences in age, class, ethnicity and gender between the researcher and children; the researcher should avoid relating to children in the role of 'mother' or 'father'; and steps should be taken to guard against the exploitation of the 'pseudo-friendships' between researchers and children which can develop during research (Oakley, 1993).

How do such ideals actually translate into the practice of conducting research? Asking children for their consent still appears to be the exception rather than the rule, even though researchers in the 1970s demonstrated how children could meaningfully consent to research following careful explanations of what the research is about (see e.g. Alderson, 1990; Lewis *et al.*, 1978). Mauthner (Mauthner, 1997) describes the dilemmas, and some of the solutions, arising in several areas of research involving children. Negotiating a private context for researchers to work with children can often be problematic, as parents or teachers sometimes do not share the same view of a child's right to privacy. Hood and colleagues (1996) and Alderson and Goodey (Alderson and Goodey, 1996) document similar issues in their research. Hood and colleagues (1996, p. 127) draw attention to the 'gate keeping' role of adults in allowing researchers access to children; while 'adults gave priority to adult duty to protect children from outsiders; this took precedence over children's right to participate in the decision to talk with us'. Mauthner (1997) describes several strategies which can be useful in minimising unequal power relationships: allowing children flexibility in terms of what they talk about; encouraging children to describe their lives through story-telling (rather than in question and answer format); using focus groups made up of groups of friends to mimic as much as possible how children usually interact; and encouraging children to engage with, and voice opinions about, the research process.

These examples highlight the experience researchers are gaining in conducting research with children. The challenges arise across a range of study designs, including surveys and statistical analyses (Qvortup and Christoffersen, 1990). The underlying issue is reframing the world to be researched *from the perspectives of children themselves* (Mayall *et al.*, 1996). The current review attempts to assess research with children on physical activity according to some of the principles of good practice suggested above. In her (1995) report produced for Barnardos, *Listening to Children*, Alderson presents a list of ten topics to consider when conducting or evaluating research with children. These topics, framed as questions, include: can parents be present or absent as the child prefers?; who is included in, and who is excluded from, the research (for example, have some children been excluded because of speech or learning difficulties?); have children or their carers helped to plan or comment on the research?; do researchers explain the project and encourage children to ask questions?; do children know that if they refuse or withdraw from the research this will not be held against them in any way?; and do the

researchers try to draw unbiased conclusions from the evidence, or do they simply use the data to support their own views?

Where parents or carers provide data on behalf of children, it is important to consider the extent to which children's perspectives are likely to have been taken into account. For example, research conducted in the ESRC's Children 5-16 Programme has highlighted differences between parents' and children's perspectives on such issues as perceptions of risk (Scott, 2000) and priorities for urban renewal (O'Brien *et al.*, 2000). This is a difficult methodological area, but an important one to consider when reviewing 'qualitative' research where privileging the subjective experience of the researched is often presented as a key criterion of quality and trustworthiness.

1.6 Review questions and approach

Following recommendations for a two-stage commissioning process for systematic reviews in health promotion (see Peersman *et al.*, 1999a), the review described in this report was carried out in two stages: a **mapping and quality screening exercise**; followed by an **in-depth review** of a sub-set of studies, chosen according to policy and practice needs. Previous systematic reviews within health promotion carried out at the EPPI-Centre and elsewhere have tended to uncover large amounts of research to be considered for inclusion in the review (see e.g. Peersman *et al.*, 1998; Tilford *et al.*, 1997). This is partly as a result of improvements in searching techniques (Harden *et al.*, 1999b). However, another important reason is that the questions of interest to health promotion tend to be very broad and encompass a wide-range of possible interventions, health topics and outcomes. Many systematic reviews in other areas of health care address much narrower questions, for example, focusing on the effects of one narrowly defined intervention on one particular outcome. Whilst this ensures that the reviewer's tasks are manageable within given time and resource constraints, it also means that it is much more difficult to piece together the results of narrow reviews to illuminate broader questions (Oliver *et al.*, 1999). There is therefore a dilemma in balancing the need for reviews of health promotion to address broad questions against the need to ensure manageable workloads.

Our initial review questions were:

1. What do surveys of factors associated with different physical activity patterns in children suggest are the important barriers and facilitators?
2. What do children and parents see as the main barriers to, and facilitators of, physical activity?
3. Which interventions to promote physical activity amongst children are effective?
4. Which barriers do these interventions aim to remove/reduce and which facilitators do they build upon?
5. To what extent do interventions address the barriers and facilitators identified as important by children and parents?

We carried out broad searches to identify as much as possible of all existing relevant research, and then described it according to a standardised strategy. Following this mapping stage of the review, we presented policy-makers and the EPPI-Centre health promotion Steering Group with a variety of options for choosing a sub-set of studies for in-depth review, and asked for their comments. The Steering Group has representation from the commissioners of the review; the policy and practitioner community; and other researchers specialising in either children's health or systematic reviews.

As a result of this process, the following types of studies were prioritised for in-depth review:

- studies focusing on children's physical activity outside school PE
- outcome evaluations which do not solely measure physiological indicators of physical activity
- other types of studies which examine the views of children (or parents) about what helps children to be physically active, and what factors prevent this.

Our in-depth review questions were therefore as follows:

1. What is known about the barriers to, and facilitators of, physical activity beyond the PE lesson amongst children aged 4 to 10?
2. Are interventions taking place beyond the PE lesson effective for increasing the physical activity levels of children aged 4 to 10?
3. What experiences/ideas do children and their parents have about the barriers to, and facilitators of, physical activity beyond the PE lesson?
4. To what extent do interventions build on these views?
5. What do the above suggest for developing effective and appropriate interventions to be tested in the future?

2. MAPPING EXERCISE: METHODS

Outline of Chapter

This chapter describes the methods used in the first stage of the review: the mapping and quality screening of research relevant to the barriers to, and facilitators of, physical activity amongst children. The mapping was conducted in three stages: (i) developing relevant inclusion and exclusion criteria; (ii) identification of relevant studies and; (iii) classification of these studies.

The criteria developed meant that the research discussed in the rest of the report covers three broad categories of studies published in English:

- *evaluations of health promotion interventions ('intervention studies') aimed at promoting participation in physical activity among children;*
- *other types of studies ('non-intervention studies' e.g. cohort studies, surveys) examining barriers and facilitators relating to children's physical activity; and*
- *systematic reviews of primary studies.*

Evaluation studies include outcome evaluations examining the impact of interventions on participation in physical activity. Such studies may include process evaluations examining how or why an intervention worked, or failed to work. While outcome evaluations carried out in any country are included in the review, we restricted non-intervention studies to those reporting UK research. Essentially these types of research were considered to be useful for illuminating the barriers to, and facilitators of, physical activity.

This chapter is relevant to all audiences as it describes in detail the basic scope of the review, but it will be of particular interest to:

- ***any readers*** who want to see in detail how this stage of the review was conducted; and
- ***researchers and information specialists*** or others interested in carrying out systematic reviews who want to read about the details of how a mapping exercise can be conducted.

This chapter may be skipped by readers who are primarily interested in the findings of the review.

2.1 Inclusion and exclusion criteria

As noted earlier, this review of research on children's physical activity is one of two reviews, the second of which will be concerned with children's healthy eating. Because it seemed likely that many studies would be common to the two review topics, the processes of developing criteria for including studies and identifying and classifying studies were run in tandem for the two reviews.

The aim of the literature search was to locate a wide variety of research dealing with three broad areas:

- i) physical activity or healthy eating;
- ii) generic and specific barriers to, or facilitators of, physical activity or healthy eating (e.g. socio-economic factors, structural factors, attitudes) or the promotion of positive health or prevention of ill-health; and
- iii) children whose average age was between 4 and 10 years.

In order to be considered relevant, a study had to:

- i) evaluate a health promotion intervention aimed at promoting physical activity ('intervention studies') or be a systematic review of such studies; or
- ii) identify how various aspects of children's lives are associated with their participation in physical activity, and/or report children's views and/or those of their parents/carers directly ('non-intervention studies' or systematic reviews of non-intervention studies).

We further defined the scope of the map by study location and language of publication. While intervention studies were included regardless of their location, we decided to include non-intervention research only if it had been carried out in the UK. The review was also restricted to studies in the English language. Unfortunately, we had insufficient resources to translate reports published in other languages.

The following set of pre-defined exclusion criteria were developed to identify studies for inclusion in the map of physical activity research.

2.1.1 Round A: exclusion on the grounds of scope

There were three 'scope' criteria. Studies were excluded if:

- i) the study's focus, or main focus, was NOT physical activity (or not the main focus for non-intervention studies).
- ii) the study did NOT focus on children aged 4 to 10 years.
- iii) the study was NOT about the promotion of physical activity, or the barriers to, and facilitators of, physical activity. Interventions were considered not to constitute health promotion if the children involved were identified or labelled as having an illness or disability (such as diabetes, obesity, hypertension).

2.1.2 Round B: exclusion on the grounds of study type

Studies were excluded if they were any of the following:

- i) editorials, commentaries or book reviews;

- ii) policy documents;
- iii) studies solely reporting the prevalence or incidence of participation in physical activity;
- iv) non-systematic reviews;
- v) non evaluated interventions;
- vi) surveys examining influences on a range of dependent variables, including physical activity, that do not explore influences on physical activity per se (e.g. studies where physical activity is one component of a composite score of health behaviour and physical activity cannot be disentangled from health behaviour more generally);
- vii) resources;
- viii) bibliographies;
- ix) theoretical or methodological studies only; or
- x) single-case studies.

2.1.3 Round C: exclusion on the grounds of location of study

Studies were excluded if they described a non-intervention study (cohort study; case control study; cross-sectional survey) NOT carried out in the UK.

2.1.4 Round D: exclusion on the grounds of language of the report

Only those studies written in the English language were included.

2.2 Identification of relevant studies

The validity of a systematic review is directly related to the comprehensiveness of its literature search (Mays and Pope, 1995). In addition to database searches, attempts were made to retrieve reports by handsearching journals, by searching reference lists, by contacting authors of included studies and by contacting key organisations involved in physical activity promotion in the UK.

Systematic searches were conducted in six major databases and eight specialist registers (table 2.1). A highly sensitive database search strategy using controlled vocabulary and free-text terms and combining three conceptual components (children; barriers and facilitators of health promotion; and physical activity) was devised in MEDLINE and translated to other databases. (Detailed search strategies are given in Appendix A.) Searches were conducted in November 2001.

Methodological filters for study design were not used, as these reduce the sensitivity of searches (Harden *et al.*, 1999b; Kahn *et al.*, 2001).

Table 2.1 Electronic database searches

Sources	Availability	Time Period of Search
Major Databases		
MEDLINE	OVID Web version	1981- 07/2001
Embase	OVID Web version	1981- 07/2001
CINAHL (Cumulative Index to Nursing and Allied Health Literature)	WinSPIRS CD-Rom, Silver Platter	1982 – 07/2001
ERIC (Educational Resource Index and Abstracts)	OVID Web version via BIDS	1985 - 2001
SSCI (Social Science Citation Index)	ISI Web of Science via BIDS	1981 - 2001
PsycINFO	WinSPIRS CD-Rom, Silver Platter	1981 – 11/2001
Specialist Registers		
BiblioMap (the EPPI-Centre register of health promotion research)	http://eppi.ioe.ac.uk	Searched 11.2001
PrevRev (an internal EPPI-Centre database containing references from previous reviews)	Mediated search, not freely available	Searched 11.2001
DARE (Database of Abstracts of Reviews of Effectiveness)	http://agatha.york.ac.uk/darehp.htm and Cochrane Library via National Electronic Library for Health (NeLH)* http://www.nelh.nhs.uk/	Cochrane Library 2001 issue 4
HealthPromis (Health Development Agency register)	http://healthpromis.had-online.org.uk	Searched 11.2001
CCTR (Cochrane Controlled Trials Register)	* (NeLH) http://www.nelh.nhs.uk/	Cochrane Library 2001 issue 4
CDSR (Cochrane Database of Systematic Reviews)	* (NeLH) http://www.nelh.nhs.uk/	Cochrane Library 2001 issue 4
CHG (Cochrane Heart Group, internal trials register)	Mediated search, not freely available	Searched 11.2001

The following journals were handsearched: *Education and Health* (from 1983 issue 1 to 2002 issue 2), *Health Education Quarterly* (from 1981 volume 8 to 1996 volume 23). This title continued as *Health Education and Behaviour* (searched from 1997, volume 24(1) to 2002 volume 29(4)).

Bibliographies of relevant studies were scanned. The authors of these studies were also contacted, where possible, and asked for additional reports. Contacts were also

made with UK organisations such as Sport England and the Health Development Agency.

All citations identified by the above searches were downloaded into an EndNote database and scanned for relevance against the review's exclusion criteria.

The above strategy was devised so as to identify a range of different types of studies and publication types, given limits on time and other resources. Databases were selected in order to cover a range of disciplines. The databases listed in table 2.1 between them cover health care, education, social sciences, psychology and health promotion. It was anticipated that the specialist registers and contact with authors and organisations would help identify unpublished studies and those published outside of journals.

2.3 Classification of relevant studies

Full reports of relevant studies were obtained and classified according to a standardised keywording system developed by the EPPI-Centre (Peersman and Oliver, 1997). This classifies reports in terms of the type of study (e.g. outcome evaluation, survey, case control study); the country where the study was carried out; the health focus of the study; the study population; and, for reports describing or evaluating interventions, the intervention site, intervention provider and intervention type.

In order to gain a richer description of the research literature, reports went on to be classified according to an additional standardised keywording system which was developed specifically for this review. This keywording system (details of which can be obtained from the EPPI-Centre on request) characterised reports in terms of their topic area, the context and characteristics of children in the study, research design and methodological attributes. These characteristics are described further below.

2.3.1 Health topic and characteristics of children

The report's topic was described in terms of its focus (whether this was on physical activity alone, or on physical activity and another focus such as healthy eating) and the health-related context of the study (the rationale presented by the authors for the promotion of physical activity). The population under study was also described (e.g. homeless, other socially excluded group; aged younger than 4, 4 to 6, 7 to 10, older than 10 and age not specified).

2.3.2 Research design

Studies evaluating interventions and reporting measured outcomes ('outcome evaluations') were described according to whether they employed the design of a randomised controlled trial (RCT), a non-randomised trial (CT), or a one group pre-test and post-test design.

Process evaluations were described in terms of the processes of interest (the intervention's implementation and/or its acceptability, and/or explaining why an intervention might have been successful or unsuccessful).

Non-intervention research (cohort studies; case control studies; cross-sectional surveys) were described according to whether they aimed: to identify factors which are linked with physical activity; to identify how specified factors relate to physical activity; or to ask children, or their parents/carers, for children's views on physical activity.

Systematic reviews were described according to whether they focused mainly on outcome evaluations (addressing questions of effectiveness) or on non-intervention research (asking other types of research questions).

2.3.3 Methodological attributes

The presence or absence of specified methodological attributes was recorded for each report. One set of attributes was used for outcome evaluations, another set for process evaluations and non-intervention studies, and a third set for systematic reviews.

Keywords were applied to outcome evaluations to note the presence or absence of: i) a control group; ii) any pre-test data; iii) any post-test data.

For each process evaluation and non-intervention study, including studies examining children's views, a record was made of whether the following were reported, not reported, or unclear: i) the number of people participating in the study; ii) their age range; iii) their gender; iv) their socio-economic background; and v) their ethnicity.

Methodological attributes of systematic reviews were also described in some detail. Keywords here noted whether or not reports presented: i) the review's aims; ii) the search strategy; iii) explicit inclusion and exclusion criteria; iv) evidence of standardised methods for extracting data from included studies; v) assessment of the methodological validity of included studies; and vi) specific recommendations for new research initiatives.

In addition, each report's analysis and presentation of data was described as one or more of the following: i) studies weighted (authors based recommendations/conclusions only on those studies which met some minimum quality criteria); ii) meta-analysis (authors used meta-analysis to pool data from individual studies); iii) narrative synthesis; or iv) studies summarised (authors described and integrated individual studies included in the review using text and/or a table).

3. MAPPING EXERCISE: RESULTS

Outline of Chapter

This chapter describes the findings of the mapping stage of the review. It presents:

- *information about the kinds of research that have been done (e.g. details of the children studied; type of barriers or facilitators addressed);*
- *the methodological characteristics of the studies; and*
- *gaps in the research literature where further research is required.*

These results were used to help identify a sub-set of studies to review in-depth. But, because the mapping gives an overview of relevant research, it is also a useful stand-alone resource. A searchable database of the studies identified in this chapter is available on-line at <http://eppi.ioe.ac.uk>.

This chapter will be of interest to:

- **researchers or commissioners of research** wishing to set an agenda for future inquiry, or considering conducting a similar mapping exercise.
- **practitioners, policy specialists and children/families** interested in the types of research conducted.

Key Messages

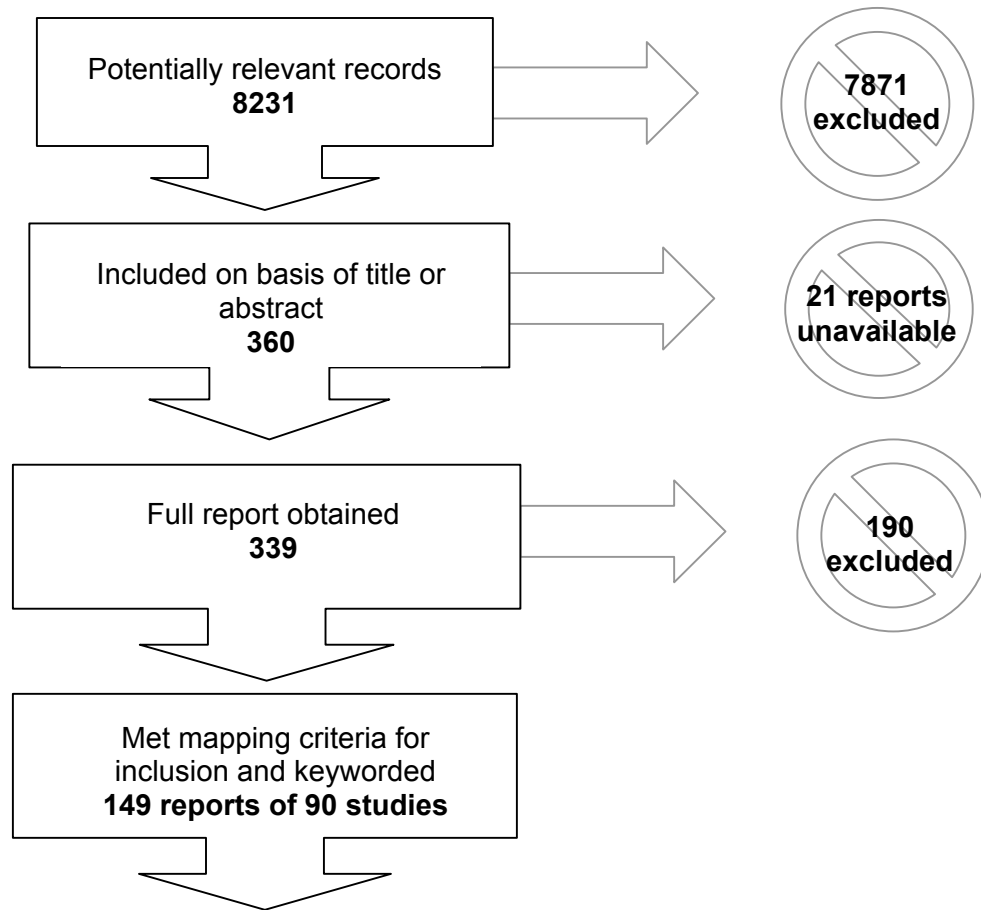
- *We screened 8,231 citations to identify 149 reports of 90 studies which met our inclusion criteria for the mapping. These included 69 intervention studies from around the world, 15 non-intervention studies from the UK and six potential systematic reviews.*
- *Most studies involved children who were not at risk of social exclusion. For example, only 16 studies focused on children from ethnic minority groups, and only 12 focused on low income families. None of these studies were carried out in the UK.*
- *Most of the interventions were implemented in primary schools, and teachers were the most common intervention providers.*
- *Most intervention studies were carried out in the USA. We identified only four outcome evaluations conducted in the UK, all of which were potentially sound. Most outcome evaluations employed a control group. Just over a third were RCTs.*

3.1 Identification of relevant studies

Our search strategy yielded 8,231 citations. From their abstracts and titles, 360 of these met the mapping criteria described earlier.

The processes involved in this initial screening are shown in Figure 3.1.

Figure 3.1: Literature flow



Full reports were obtained and processed for 339 (94%) of the 360 citations within the time scale for the review. Ten of the 21 citations which were unavailable were academic dissertations from the USA. Once full reports had been obtained, a further 190 were found not to meet the inclusion criteria, leaving a total of 149 reports. These described a total of 90 studies; some studies were described in more than one report, and several reports contained more than one study.

Table 3.1 shows the productiveness of the different sources searched. Of the 149 reports, 84 were found exclusively in one source; the rest were found in two or more.

Table 3.1 Sources of reports (N=149).

Source	N
Major database only	47
Specialist register only	22
Handsearching, contact with authors or Searching reference lists only	15
Found at more than one source	65

Of the 84 reports located exclusively in one source, 47 came from a major electronic database. MEDLINE found most, followed by Embase and CINAHL. A further 22 reports were found exclusively in specialist registers. The most productive of these was BiblioMap (11 reports). Searching the reference lists of reports was as productive as the most productive database, resulting in 15 additional reports.

Of the 12 reports of the ten studies which went on to be analysed at the in-depth stage of this review, seven were found exclusively in one source. Four of the five non-intervention studies presenting children's views came exclusively through searches of specialist registers, and the fifth through contact with the author.

3.2 Classification of studies

3.2.1 Study type

Table 3.2 shows the 90 studies described in the 149 reports according to study type.

Of the 90 studies, 69 were classified as intervention research. All but three of these studies were outcome evaluations, contained either in reports that evaluated outcomes only (n=50) or outcomes together with processes (n=16). The remaining three were process evaluations alone. A further 15 of the 90 reports were classified as 'non-intervention' research; all of these were cross-sectional surveys. There were six 'potential' systematic reviews. Five focused on the effectiveness of interventions, and one was an overview of the determinants of physical activity (Sallis *et al.*, 2000). The relative proportions of 'intervention' and 'non-intervention' studies identified in our review reflect the inclusion criteria we chose to use (restricting non-intervention research to UK studies), rather than the general state of research on physical activity and children.

Table 3.2 Studies (N=90) by study type.

	N
'Intervention studies'	69
Outcome evaluations alone	50
Process evaluations alone	3
Outcome evaluations with integral process evaluations	16
'Non-intervention studies'	15
Cross-sectional survey	15
Systematic reviews	6

3.2.2 The context of physical activity

Studies were coded according to the context within which authors placed physical activity (table 3.3).

Table 3.3: Studies (N=90) according to their health contexts*

	N
Physical activity context only	21
Other context(s) in addition to physical activity	69
Healthy eating	58
Heart-health/Cardiovascular	32
Smoking cessation	16
Inequalities	12
Obesity	10

*Each study could include more than one health context.

In 21 of the 90 studies the rationale was promoting physical activity without relating physical activity to other specific aspects of health. The most common aspect of health related to physical activity promotion was healthy eating.

3.2.3 Children studied

Table 3.4 shows the findings of the mapping exercise in terms of the age range of the children included in different studies

Table 3.4: Studies (N=90) according to age range

	N	%
4 to 10 years	26	29
Other age range, with average age between 4 and 10	50	56
Age not specified	14	16

Only 26 (29%) of the 90 studies included children with ages within the exact age range of interest to this review (4 to 10 years). Most (n=50, 58%) of the rest covered a broader age range, but had an average of 4 to 10 years.

Table 3.5 shows the social characteristics of the children involved in the 90 studies.

Table 3.5: Studies (N=90) according to the social characteristics of the target population group*

	N
Socially excluded or other 'at risk' group	22
Ethnic minority	16
Low income	12
Physical illness or disability	2
Children in general	70
Other group (at risk of cardiovascular disease and type 2 diabetes)	2

*Children could have more than one social characteristic, so the Ns exceed 90.

Most of the children included in the 90 studies were not from a socially excluded or otherwise 'at risk' group.

3.3 Characteristics of intervention studies

This section discusses the characteristics of the 69 intervention studies which were among the 90 studies found in the mapping exercise.

3.3.1 Country in which studies were conducted

Table 3.6 shows the countries in which the interventions described in the 69 studies were implemented.

Table 3.6: Intervention studies (N=69) according to country of intervention

	N	%
USA	47	68
Australia	8	12
UK	4	6
Ireland	2	3
Canada	2	3
Rest of Europe*	3	4
Rest of World**	3	4

* Germany, Greece, Netherlands

** Pakistan, China, Israel

Most of the intervention studies (n=47, 68%) were carried out in the USA. Eight (12%) were from Australia. Only four (6%) were from the UK (Abbott and Farrell, 1989; Balding, 2000; Sahota *et al.*, 2001; Stratton, 2000) and two (3%) were from Ireland (Friel *et al.*, 1999; Kelleher *et al.*, 1999). Europe outside of the UK and Ireland accounted for three (4%) of the studies and other individual countries around the world a further three (4%). These figures may reflect bias towards studies published in the USA within the bibliographic sources searched; there is also clearly likely to be a bias as a result of our inclusion criteria restricting studies to those written in the English language.

3.3.2 Intervention site

Table 3.7 shows the settings described in the 69 intervention studies. Each intervention could involve more than one site; a total of 97 sites were reported in the 69 studies.

Table 3.7: Intervention sites (N=95) described in the intervention studies (N=69)

	N
Community	9
Educational setting	60
Primary education	56
Secondary education	2
Other	2
Health care setting	6
Health care unit	5
Hospital	1
Home	20

Schools were the most frequent sites for interventions, followed by homes and the community, with a small number of sites in the health care domain. Of the 20 home

settings described in the intervention studies, 15 were also linked to schools as intervention sites (data not shown in table).

3.3.3 Types of intervention

Table 3.8 shows the types of interventions evaluated in the 69 studies. Each study could examine several intervention components; the 69 studies described 88 components altogether.

Table 3.8: Intervention components (N=88) described in the intervention studies (N=69)

	N
Classroom-based	41
Enhanced PE lessons	24
Increased access to healthy foods	9
After-school clubs	7
Decreased sedentary behaviour	2
'Hour a day' physical activity	2
'5 A Day' healthy eating	1
Tailored for girls	1
Tailored to readiness to change	1
School transport	0

The single most popular type of intervention (41/88) was classroom-based, and the next most popular (24/88) consisted of enhanced PE lessons. Ten interventions included a focus both on promoting physical activity and on encouraging healthy eating.

3.3.4 Intervention provider

Table 3.9 shows the 10 different categories of intervention provider described in the 69 intervention studies. Interventions could involve more than one provider; altogether the intervention studies reported 137 types of provider.

Table 3.9: Intervention providers (N=137) described in the intervention studies (N=69)

	N
Teacher	53
Parent	31
Health professional	17
Community	13
Health promotion practitioner	6
Community worker	5
Researcher	5
Psychologist	3
Counsellor	2
Lay therapist	2

The biggest single category of intervention provider was teachers (53/137), followed by parents (31/137) and health professionals (17/137).

3.3.5 Outcomes measured

Out of the 69 intervention studies, 66 measured the impact of interventions on outcomes (see table 3.2 earlier). A broad range of outcomes was measured. Table 3.10 shows the data; a total of 224 outcomes were reported in the 66 studies.

Table 3.10: Outcomes measured (N=224) described in the outcome evaluation studies (N=66)

	N
Physiological measures	37
Knowledge/awareness	36
Physical activity	33
Fat intake	25
Attitudes/beliefs	20
Other intake	14
Self-efficacy/self-esteem	12

Table 3.10: Outcomes measured (N=224) described in the outcome evaluation studies (N=66) cont'd

Salt intake	10
Other behaviours	8
Fruit or vegetable intake	8
Sugar intake	6
Fibre intake	5
Intentions	3
Sedentary activity	3
Fitness	2
Structural outcome	2
Fiscal	0

The most popular outcomes were physiological measures such as body mass index, lung capacity and cholesterol levels (37/224). Of the studies that measured physiological outcomes, seven of these measured physiological outcomes alone (not shown in table). The next most popular outcomes were knowledge/awareness relating to the importance of physical activity (36/224 outcomes) and some measure of physical activity itself (33/224).

3.4 Methodological attributes of intervention studies

3.4.1 Outcome evaluations

Table 3.11 shows the design of the outcome evaluations.

Table 3.11: The design of the outcome evaluations (N=66)

	N	%
Randomised controlled trial	27	41
Controlled trial	24	36
One group pre- and post-test	14	21
Not stated	1	2

Fifty-one of the 66 outcome evaluations employed a control group design; 27 were RCTs. The design of one study was not stated, and the others were one group pre- and post-test studies.

Using the classification described earlier (equivalent intervention and control groups,

equivalent pre- and post-test data reported), just over three quarters of the outcome evaluations identified in the mapping process (n=50, 76%) were judged to be 'potentially sound'. All four of the 66 outcome evaluations carried out in the UK were classified as 'potentially sound' (not shown in table).

3.4.2 Process evaluations

We identified a total of 19 process evaluations; 16 of these were carried out alongside outcome evaluations, so there were only three freestanding process evaluation studies (see table 3.2 earlier). Table 3.12 shows the processes evaluated in this group of studies. Each study could describe more than one process; the total added up to 53.

Table 3.12: Processes evaluated (N=53) in process evaluations (N=19)

	N
Implementation	15
Acceptability	13
Skills	8
Partnerships	5
Materials	5
Management	4
Accessibility	3

Implementation and accessibility were the processes most often evaluated in the process studies (15/53 and 13/53 respectively).

Only one process evaluation was conducted in the UK (Balding, 2000). The rest were carried out in the USA (n=17) and Canada (n=1). All three process evaluations not attached to an outcome evaluation were conducted in the USA (not shown in table).

Table 3.13 shows the sample characteristics reported in the process evaluations.

Table 3.13 Sample characteristics reported in the process evaluations (N=19)

	N	%
Sample number	15	79
Age	10	53
Ethnic group	10	53
Sex	9	47
Response rate	9	47
Socio-economic background	3	16

Whilst 15 (79%) of the 19 studies reported the number of children in their sample, only 9 (47%) gave the response rate. The sex, age and ethnicity of participants were each reported in fewer than 60% of the studies. Data on socio-economic background was given for only two studies. Only one study collected data on all six characteristics shown in table 3.13.

3.5 Methodological attributes of non-intervention studies

Our mapping of the research literature on barriers and facilitators related to children's physical activity included studies which did not describe interventions designed to change participation levels, but addressed other research questions using different designs. This section looks at the UK-based research classified as 'non-intervention studies'. This consisted of 15 cross-sectional surveys (see table 3.2 earlier). Table 3.14 shows the characteristics of the samples included in these surveys.

Table 3.14: Sample characteristics reported in the non-intervention studies (N=15)

	N	%
Sample number	13	87
Age	13	87
Sex	13	87
Response rate	8	53
Socio-economic background	4	27
Ethnic group	0	0

As with the process evaluations described in the previous section, there were general problems with poor reporting of participant details. Whilst 13 studies reported the number sampled, only eight gave a response rate. Age and sex were each reported in twelve studies, but no studies described the ethnicity of the children in their sample and only four provided information about their socio-economic status. None of the 15 studies reported all six characteristics.

Reporting of response rates was slightly higher (53%) for the non-intervention than for the intervention studies (47%, table 3.13). Only eight of the 15 non-intervention studies reported both the sample number and the response rate. These levels of reporting make it generally difficult to assess whether the conclusions of studies are representative of the group of children from whom the samples were drawn.

3.6 Characteristics and methodological attributes of systematic reviews

Six systematic reviews were located which included studies relating to interventions to promote children's physical activity (Fulton *et al.*, 2001; Keays and Allison, 1995; Pender, 1998; Resnicow and Robinson, 1997; Sallis *et al.*, 2000; Stone *et al.*, 1998).

Five of these reviews studied the effectiveness of various interventions, and one was a review of the determinants of physical activity (Sallis *et al.*, 2000). One of the effectiveness reviews also reviewed determinants of physical activity (Pender, 1998).

The effectiveness reviews considered the research evidence from weight gain preventions interventions (Fulton *et al.*, 2001); school-based interventions for moderate to vigorous physical activity (Keays and Allison, 1995); interventions which aimed to help children and young people adopt active lifestyles sustainable into adulthood (Pender, 1998); cardiovascular disease prevention interventions (Resnicow and Robinson, 1997), and interventions to promote physical activity in school and community settings (Stone *et al.*, 1998). None of the reviews looked specifically at the 4 to 10 year old age group. Most included studies, which considered children and young people whose age was not further specified.

Table 3.15 shows the methodological attributes of the six systematic reviews. Four of the six reviews clearly stated their aims, search strategies and inclusion criteria. Only two described quality assessment methods.

Table 3.15: Methodological characteristics of the systematic reviews (N=6)

	N
Aims stated	5
Search strategy stated	5
Inclusion criteria stated	5
Data extraction methods stated	3
Quality assessment stated	2
Included meta-analysis	1
Included weighting of studies	3
Included narrative synthesis	4
Included summary of studies	2
Future directives stated	5

4. IN-DEPTH REVIEW: METHODS

Outline of Chapter

This chapter describes the methods used in the in-depth review. It explains how the results of the mapping exercise were used to:

- *prioritise the focus of the in-depth review; and*
- *select the most appropriate study types to include in the in-depth review: UK studies which seek children's or parents' own descriptions of barriers and facilitators relating to children's physical activity; and intervention studies of a high methodological quality.*

This chapter will be of interest to:

- ***any readers** who want to understand the details of how this stage of the review was conducted.*
- ***researchers** or others interested in how the results of a mapping and quality screening exercise can be used in a systematic review, or how different study types can be included.*
- ***policy specialists, practitioners and children or their parents.** These groups may find section 4.1 of most interest, since this describes how different stakeholders had an input into defining the most appropriate and relevant literature to review in-depth.*

4.1 From mapping the literature to in-depth review

The mapping exercise identified many studies relevant to identifying barriers to, and facilitators of, physical activity. This provided a basis for deciding on the most appropriate types of studies to include in the in-depth review. We took advice on how to focus the in-depth review from the EPPI-Centre's health promotion Steering Group.

Intervention studies, which focused on physical activity 'beyond the PE lesson', were considered to be an important type of study to include in the review. Although the question of how to enhance the quality of PE lessons is an important topic, this was felt to be a curriculum issue, requiring a separate review to address it adequately. It was decided that the review would be most useful if it could inform approaches to promote physical activity in contexts where children have some choice about participation. Such a focus would not exclude the school completely – it would cover physical activity in break and lunchtimes at schools; classes providing skills and knowledge related to being physically active; and the use of school sports facilities outside of the school day.

Further decisions about inclusion were made regarding the type of outcomes assessed, the methodological quality of research, and the types of studies to review in depth. Studies that measured only physiological outcomes as an indicator of participation in physical activity were excluded, on the grounds that these types of studies would probably reveal little about changes either in physical activity levels or in children's motivation to be physically active. Outcome measures more suited to health promotion and public health would include children's attitudes, intentions and behaviour. We also needed to focus our in-depth review only on those outcome evaluations that were potentially methodologically sound, and thus capable of providing reliable findings.

Although we identified six potentially systematic reviews in the mapping exercise we did not include the findings of these in the in-depth review. In earlier reviews we had found this to be a problematic exercise (see e.g. Harden *et al.*, 2001b), largely because reviews frequently fail to provide sufficient detail of the individual studies they contain. This makes independent appraisal of studies and the interventions they evaluate very difficult. However, we did screen all the studies included in the six systematic reviews for inclusion in this review.

In addition to intervention studies, we included a wide range of other studies that described factors influencing children's participation in physical activity, rather than evaluating particular interventions. We decided that these descriptive studies had to have *sought children's own views as to what helps them to be physically active and/or what hinders this*, rather than inferring their experiences through the eyes of researchers. Because of the young age of some of the children studied in this review, studies seeking the views of parents or carers were also considered. We took the further decision to restrict studies of children's views by publication date and location, because the main strength of such studies lies in their ability to describe the specific contextual factors influencing children at a certain point in time and in a certain location.

The remainder of this chapter describes, for each study type in turn, the process of inclusion and exclusion of studies, quality assessment and data extraction.

4.2 Outcome and process evaluations

4.2.1 Inclusion and exclusion criteria

Two reviewers independently screened outcome evaluations, and any process evaluations linked to them, according to the following criteria:

- (i) the study has as its main focus the promotion of physical activity;
- (ii) the study has as its main focus children aged 4 to 10 years;
- (iii) the study is of an intervention that aims to make a change beyond the PE lesson;
- (iv) the study's measures are not limited to physiological indicators of physical activity; and

- (v) the study includes a comparison or control group.

All outcome evaluations meeting these criteria went on to the quality assessment and data extraction phase of the review. Integral process evaluations also went on to the data extraction phase of the review. These did not, however, undergo any quality assessment.

4.2.2 Quality assessment and data extraction

The procedures and criteria used for assessing methodological quality were the same as those described in previous EPPI-Centre health promotion reviews (see e.g. Oakley *et al.*, 1996a; Peersman *et al.*, 1998; Peersman *et al.*, 1996). We deviated from past practice in this review, however, by undertaking methodological quality assessment of studies first, in order to restrict the studies going on to complete data extraction. The keywords applied at the mapping stage of the review were used to identify those studies that would not progress to full data extraction.

Following the procedures used in earlier EPPI-Centre health promotion reviews, four 'core' criteria were used to divide the outcome evaluations into two broad groups: 'sound' and 'not sound'. 'Sound' outcome evaluations were those deemed to meet the four criteria of:

- (i) providing pre-intervention data for all individuals in each group. (An exception was made for those studies using the Solomon four-group design (Campbell and Stanley, 1966), in which intervention and control/comparison groups are further randomised to receive pre-intervention surveys or not, since this means that the usual range of pre-intervention data is not available for half the participants in each group.)
- (ii) providing post-intervention data for each group.
- (iii) reporting findings for each outcome measure indicated in the aims of the study; and
- (iv) employing a control/comparison group equivalent to the intervention group on socio-demographic and outcome variables.

A standardised data extraction framework (Peersman *et al.*, 1997) was used to describe and further appraise the sound studies. These guidelines enabled reviewers to extract data on the development and content of the intervention evaluated, the populations involved, the design and results of the outcome evaluation and details of any integral process evaluation. Data were entered onto a specialised computer database (EPIC). As part of data extraction, the following five additional methodological qualities were sought to describe the 'sound' outcome evaluations:

- (i) provision of data on numbers of participants recruited to each condition;
- (ii) clear definition of the aims of the intervention;
- (iii) description of the study design and content of the intervention sufficiently detailed to allow replication;

- (iv) use of random allocation to control or comparison group(s);
- (v) reporting of loss to follow-up, or attrition, for each group.

4.3 Studies of children's (or parents') views

4.3.1 Inclusion and exclusion criteria

All UK studies identified in the mapping which reported the views of children (or parents/carers) were screened by two reviewers independently according to whether they met the following criteria:

- (i) reporting on children's or parents'/carers' views about the barriers to, or facilitators of, physical activity beyond classroom-based PE lessons;
- (ii) privileging children's or parents'/carers' views. 'Privileging' here means that children's or parents' views are presented directly as data that are valuable and interesting in themselves, rather than solely as a route to generating variables to be tested in a predictive or causal model.
- (iii) published in or after 1990;
- (iv) reporting at least some information on all of the following: the research question; procedures for collecting data; how these captured the phenomenon under study; sampling and recruitment; and at least two sample characteristics.

4.3.2 Data extraction and quality assessment

All studies meeting the above inclusion criteria were examined in-depth. A standardised data extraction and quality assessment framework was used. This had been developed and piloted in a previous EPPI-Centre review of peer-delivered health promotion for young people (Harden *et al.*, 1999a), and a series of reviews examining the barriers to, and facilitators of, mental health, healthy eating and physical activity in young people (Harden *et al.*, 2001b; Rees *et al.*, 2001; Shepherd *et al.*, 2001). The framework enabled reviewers to extract data on many methodological and substantive details of studies, including the findings.

The procedures and the criteria used for assessing methodological quality built on those used in the earlier EPPI-Centre reviews cited above. Studies were assessed according to 14 criteria. These criteria were informed by those proposed for assessing the quality of 'qualitative' research (Boulton *et al.*, 1996; Cobb and Hagemaster, 1987; Mays and Pope, 1995; Medical Sociology Group, 1996) and by principles of good practice for conducting social research with children (Alderson, 1995).

The 14 criteria covered three main quality issues. Seven related to the quality of the *reporting* of a study's aims, context, rationale, methods and findings. Each study was assessed according to whether:

- (i) the aims and objectives were clearly stated;
- (ii) there was an adequate description of the context in which the research was carried out;
- (iii) sufficient justification was given for why a study was carried out in a particular way (e.g. detail on how the study was informed by an existing body of knowledge);
- (iv) there was a clear description of sampling methods and the sample;
- (v) there was a clear description of data collection methods;
- (vi) there was a clear description of data analysis methods; and
- (vii) sufficient original data were presented to mediate between data and interpretation.

A further four criteria related to the *strategies* employed to establish the reliability and validity of data collection tools and methods of analysis, and hence the validity of the findings. Each study was assessed according to whether there had been at least some attempt to establish the:

- (viii) reliability of data collection tools;
- (ix) validity of data collection tools;
- (x) reliability of the data analysis methods; and
- (xi) validity of data analysis methods;

The final three criteria related to the assessment of the *appropriateness* of the study methods for ensuring that findings about the barriers to, and facilitators of, physical activity were rooted in children's own perspectives. In relation to this, reviewers were asked to judge studies according to whether they:

- (xii) used appropriate data collection methods for helping children to express their views;
- (xiii) used appropriate methods for ensuring the data analysis was grounded in the views of children; and
- (xiv) actively involved children to an appropriate degree in the design and conduct of the study.

Taken together, these 14 criteria provide a measure of the extent to which we can be confident that a particular study's findings can make a valuable contribution to this review.

In order to synthesise the findings on children's views across studies, using the data tables and structured summaries, reviewers identified:

- the differences and similarities in findings across studies;
- any possible reasons (e.g. different kinds of samples or methods) for differences between studies; and
- the ways in which the differences and similarities across studies contribute to a greater understanding of children's (and/or parents'/carers') views than that which can be achieved through the findings of any one study.

Two researchers carried out all the procedures in this section independently, and then met to compare their assessments and resolve any differences.

5. IN-DEPTH REVIEW: THE OUTCOME EVALUATIONS

Outline of Chapter

This chapter presents the results of the data extraction and critical appraisal of the intervention studies included in the in-depth review.

- *Section 5.1 describes the characteristics of the interventions.*
- *Section 5.2 describes the methodological quality of the evaluations reported of these interventions.*
- *Section 5.3 considers the findings from methodologically sound outcome evaluations and any associated process evaluations.*

This chapter should be read by:

- ***practitioners, policy specialists, and others who are interested in what kinds of interventions are effective for promoting physical activity (in particular section 5.3); and***
- ***researchers or research commissioners who are interested in the methodological quality of evaluations and how these might be improved in the future (in particular section 5.2).***

Key Messages

- *Twenty-one outcome evaluations met the criteria for in-depth review.*
- *Most of the interventions were focused on both healthy eating and physical activity. Only six targeted children's activity levels without also aiming for changes in diet. Two aimed to reduce sedentary behaviour rather than encourage physical activity.*
- *All but three of the interventions were provided mainly or solely in school settings, and teachers provided the intervention in all but four cases. Most of the intervention content was based on providing information. Fewer than a quarter of the interventions used environmental modification or increased access to resources or services to influence children's physical activity.*
- *Particular methodological problems were: a failure to report pre- and post-intervention data on all individuals; non-equivalent study groups; and not reporting the impact of the intervention all outcomes targeted*
- *Only five of the evaluations were judged to be methodologically sound. All were implemented in the USA, four in schools and one in a primary care clinic.*

The findings from these five studies were that:

- *A three year-long, school-based approach that included classroom lessons, changes to school meals, family involvement and modifications to PE lessons (CATCH) resulted in children spending more time participating in vigorous physical activity. This effect was still visible three years after intervention activities had ceased.*
- *Children's participation in organized physical activity was influenced by an intervention initiated in a primary care clinic, which combined 20 minutes of family training in use of an electronic TV monitor with access to a monitor for four weeks. However, it was unclear whether this approach was any better than a counselling-only session.*
- *In another study, children receiving the same type of TV monitor, along with six months of classroom-taught sessions on monitoring their own TV use, watched fewer hours of TV and played fewer video games per week. They also decreased the number of meals they ate in front of the TV.*
- *Two interventions combining teacher-led classroom sessions with parental involvement ('Eat Well and Keep Moving' and 'Know Your Body') improved children's physical activity-related knowledge.*

5.1 Characteristics of physical activity promotion evaluated in outcome evaluations

Not all the 69 evaluations of interventions to promote physical activity described in the mapping were included in the in-depth review. Three evaluated processes without also evaluating outcomes, six were excluded because they evaluated interventions that sought solely to make changes to PE lessons, and 19 were excluded because they measured physiological outcomes only. A further ten, on closer inspection, were found not to involve children aged between four and 10 years or to be promoting physical activity. Of the 31 that remained, only 21 met the methodological criterion of employing a comparison or control group.

Thus 21 studies were considered further. All but one of these 21 studies (Balding, 2000) were published in peer-refereed journals, with just under a half (n=10) published after 1997. Most (n=14) were carried out in the USA. Four studies were undertaken in the UK (Abbott and Farrell, 1989; Balding, 2000; Sahota *et al.*, 2001; Stratton, 2000) and one each in Ireland, Greece and the Netherlands.

The rest of this section describes the interventions delivered and populations involved in the 21 studies.

Most of the interventions were focused on both healthy eating and physical activity. Only six targeted children's activity levels without also aiming for changes in diet (Balding, 2000; Ernst and Pangrazi, 1999; Ford *et al.*, 2002; Mott *et al.*, 1991; Stratton, 2000; Zonderland *et al.*, 1994). Two interventions aimed to decrease sedentary behaviour (Ford *et al.*, 2002; Robinson, 1999), by targeting the amount of time children spent watching TV or videos or playing home video-games. The evaluation of the second of these interventions also examined its impact on the number and type of meals eaten in front of the TV.

Table 5.1 shows intervention settings and types of providers. Each intervention could have more than one setting or provider; together the 21 studies reported 32 different settings and 37 providers.

Table 5.1: Intervention setting (N=32) and intervention provider (N=37) in all included outcome evaluations (N=21)

Intervention setting (N=32)	N	%
Primary education	18	56
Secondary education	2	6
Home	8	25
Community	2	6
Health care unit	2	6
Intervention provider (N=37)	N	%
Teacher	17	46
Parent	8	22
Health professional	4	11
Health promotion practitioner	3	8
Other (counsellor, community worker, researcher)	3	8
Unspecified	2	5

Most of the settings mentioned were primary schools. The two secondary school settings involved primary aged children who progressed to secondary school during the intervention, which was five years in duration (Walter, 1989; Walter *et al.*, 1988). Both these studies evaluated the same intervention, the 'Know Your Body' programme, but on two ethnically and socio-economically different populations in different parts of New York.

The home was also a relatively frequent setting (n=8), although all but one of the home settings were linked to interventions delivered mainly in schools. Three interventions that did not include a school setting were a fitness, advice and education project for families based at a specially designated community centre (Baranowski *et al.*, 1990), and two programmes initiated at health care centres (Ford *et al.*, 2002; Kelleher *et al.*, 1999).

The study reported by Smolak and colleagues (Smolak *et al.*, 1998) provides an illustration of the way children's home environments were most frequently used to promote physical activity. This study evaluated the 'Eating Smart, Eating for Me' programme which focused on healthy eating and exercise as a way of preventing the onset of eating disorders. Researchers hoped to involve parents by sending them nine newsletters at home over a period of two months. These detailed the

intervention's philosophy and discussed aspects of eating disorders covered in the school curriculum. In other programmes, for example the study described by Gortmaker and colleagues (Gortmaker *et al.*, 1999), children took home work with instructions to involve family members. This intervention also provided information to parents in the form of details of local free or low-cost healthy eating or physical activity programmes. In one intervention (Davis *et al.*, 1995), children were asked to interview older members of their families about their experiences of physical activity and healthy eating when growing up. Several (e.g. Manios *et al.*, 1999) invited parents into the school for educational sessions. There were two interventions (Ford *et al.*, 2002; Robinson, 1999) with a home component that went further than simply giving parents information. These were based on the use of electronic TV monitors, which were lent to participating households in the hope that they would enable families to 'budget' their TV use.

Teachers, parents, health professionals and others were involved in delivering the interventions. The predominance of teachers reflects the school setting of most of the interventions.

Table 5.2 shows the range of intervention types. Each intervention could consist of more than one type of intervention; together, the 21 outcome evaluations reported 78 interventions.

Table 5.2: Intervention types (N=78) in all included outcome evaluations (N=21)

	N	%
Information/education	21	27
Physical activity	14	18
Practical skill development	11	14
Professional training	9	12
Bio-Feedback	5	6
Incentives	4	5
Environmental modification	4	5
Parent training	3	4
Increased access to resources	3	4
Advice/counselling	3	4
Increased access to services	1	1

Most of the interventions were focused on providing information and/or education, formalized by curricula delivered in classrooms and taught by usual classroom teachers. Many studies involved participation in physical activities alongside classroom education. For example, the children taking part in the study by Parcel and colleagues (Parcel *et al.*, 1989) attended lessons which aimed to create positive

expectations about being physically active, and taught them to identify aerobic exercise. The children then also took part in fitness activities aimed at influencing cardio-respiratory endurance, muscular strength, flexibility, agility and balance. These two intervention components were linked by rewards for children's physical activity in the form of verbal praise from teachers, and stickers and other prizes.

Incentives such as these were used in a number of interventions, as was the provision of advice in brief counselling sessions and the opportunity for children to develop and practice skills related to physical activity. One of the school-based interventions (Ernst and Pangrazi, 1999), explicitly aimed to shift the responsibility for an active lifestyle from supervising adults to pupils. The 'PLAY' programme centred on physical activity breaks taken each school day. Initially, breaks (which could be spent doing anything other than standing or sitting) were organized by teachers, who also participated. An intermediate step was teachers leading and participating in a variety of active games, such as 'hospital tag'. Towards the end of the intervention period, the children were asked to record their activity in log-books and had a set of activity goals.

Several interventions (e.g. Mott *et al.*, 1991) aimed to enhance student learning about the health benefits of physical activity using bio-feedback. Such interventions provided information on fitness levels personalized for each individual pupil in an attempt to encourage healthier behaviour. Professional training was another relatively frequent component. In all cases, this comprised teacher training about the content of new curricula. In a smaller number of cases, other school staff (for example, school meals staff (Luepker *et al.*, 1996)) also received training, or there was training focused on promoting general 'wellness' among staff (Gortmaker *et al.*, 1999). Interventions were frequently designed to help children develop relevant practical skills as well as increased knowledge about healthy behaviour. In one intervention (Baranowski *et al.*, 1990), participants were taught how to take their own pulse when exercising so as to achieve a suitable level of exercise. Children in the 'PLAY' intervention (Ernst and Pangrazi, 1999) and the intervention evaluated by Robinson (1999) were encouraged to monitor their own physical activity levels and TV watching habits. Since many of the interventions were also focused on healthy eating, many of the skills related to selecting and preparing healthier meals and snacks.

Only three interventions included any element of formal parent 'training'. Manios and colleagues (1999) report an evaluation of the 'Know Your Body' intervention in Greece, where parents were invited to meetings at which presentations were given on healthy eating and physical activity. In the 'Staying Well' project, implemented in the UK (Abbott and Farrell, 1989), parents were invited to school assemblies to hear presentations from their own children about what they had been learning. Parents in the intervention evaluated by Ford and colleagues (2002) took part in a discussion session which aimed to impart techniques for helping children reduce their TV, video and video-game use.

In this last intervention, information and education components were reinforced with provision of an electronic TV monitor. Such provision of additional resources was relatively infrequent, being found in only three of the 21 outcome evaluations. In addition to the two evaluations involving TV monitors, one intervention provided free babysitting and transport to enable parental participation in exercise sessions (Baranowski *et al.*, 1990).

The modification of children's environments was infrequent. One intervention based solely on environmental modification was the fluorescent painting of playgrounds with shapes such as snakes and ladders, hopscotch and clock faces. This was evaluated in the UK by Stratton (2000). Other examples were the development of school meals services in interventions aiming to promote cardiovascular health or prevent obesity through both healthy eating and physical activity (Luepker *et al.*, 1996; Parcel *et al.*, 1989; Sahota *et al.*, 2001). The last of these studies also describes how participating schools drew up and implemented action plans designed to promote physical activity and healthy eating. In seven out of ten of the study schools, modifications to school playgrounds were part of the action plan.

Only one intervention evaluated the impact of increased access to services. The 'Fit to Succeed' project, evaluated as a pilot by Balding (Balding, 2000) offered pupils in schools in Exeter in the UK free introductory sessions at clubs and facilities run by the local authority. The children's use of facilities was supported by a consortium that included a university department and schools and local authority bodies responsible for the management of leisure facilities. The intervention also included the distribution of newsletters and teaching materials to participating schools, activity records for children and the awarding of certificates to children who completed a certain number of activity sessions.

Two of the 21 outcome evaluation studies involved children younger than four (Manios *et al.*, 1999; Stratton, 2000); 12 involved children older than 10, and in one study the age range was not specified. Most of the interventions were targeted at a relatively narrow age range. Of the studies involving children older than 10, only one involved children aged over 12 at the start of the intervention. The study reported by Kelleher and colleagues (1999) evaluated a counselling-based health promotion programme delivered in an Irish primary care clinic to children aged between 8 and 15.

Fifteen of the 21 evaluations were classified as targeting children in general, as opposed to children who might be considered to be socially excluded or at risk in some specific way. None of the six studies directed at socially excluded children were conducted in the UK. Two of the interventions described were developed with a specific ethnic group in mind. In one case (Baranowski *et al.*, 1990) the intervention was developed so as to be culturally relevant for African Americans. Navajo and Pueblo Native American children were the focus of the other (Davis *et al.*, 1995). Three interventions were evaluated with populations where over 50% of the children were African American and/or Hispanic (Ford *et al.*, 2002; Gortmaker *et al.*, 1999; Walter *et al.*, 1988). Only one study (Harrell *et al.*, 1998) involved children considered at risk in some other way; the children targeted in this study were at risk of developing cardiovascular disease.

5.2 Assessment of the methodological quality of outcome evaluations

Table 5.3 shows how many of the 21 studies met each of the four methodological criteria used in this review to determine whether a study is 'sound'.

Table 5.3: All included outcome evaluations (N=21) meeting the four soundness criteria

	N	%
Impact of intervention reported for all outcomes	16	76
Equivalent study groups at baseline	8	38
Pre-intervention data reported for all individuals/groups	4	19
Post intervention data reported for all individuals/groups	15	71
Meeting all four of the above criteria	4	19

The table shows that only four of the 21 studies met all four of the criteria. One further study, the evaluation reported by Luepker and colleagues (1996), did not meet the criterion for reporting pre-intervention data for all individuals. However this study was included because the authors used an intention-to-treat analysis, so all those present at baseline were represented in the analysis. The criterion of the reporting of pre-intervention data attempts to appraise the potential for selection bias in a study, and the use of an intention-to-treat approach, along with random allocation, were instead considered sufficient protection.

The most frequently met of the four criteria was reporting data for all outcomes. Almost a quarter of the evaluations, however, failed to report on one or more of the outcomes that were specified in their study's aims. Just over a three quarters failed to present pre-intervention outcome data for both groups in the study. Just over a quarter failed to provide post-intervention outcome data for both study groups. Only a third provided evidence that study groups were comparable before the intervention. Fewer than one in five presented baseline data separately for intervention and control groups for all the individuals present before the intervention. Of the remainder, nine presented baseline data only for those who remained at the end of the study, one presented data but did not give these separately for intervention and control groups, two presented no baseline data, only differences between baseline and follow-up, and in five studies the presentation of data was judged to be unclear.

5.3 Which interventions are effective?

Our ability to answer the question about interventions effective in promoting children's physical activity is limited to the five methodologically sound outcome evaluations. All five studies are from the USA.

The five sound evaluations were of interventions that differed in terms of aims, settings, duration and methods. All five interventions had the prevention of cardiovascular disease or obesity as an ultimate objective. Four used an RCT design. One used matched schools. All but one (Ford *et al.*, 2002) of the five interventions were implemented in school settings and involved classroom-based learning and skill development.

While three of the interventions (Gortmaker *et al.*, 1999; Luepker *et al.*, 1996; Walter *et al.*, 1988), aimed to influence physical activity directly, the other two (Ford *et al.*, 2002; Robinson, 1999) attempted to change children's sedentary behaviour, in particular their TV watching. The two TV-reduction interventions were shorter in duration than the other three interventions. Ford's clinic-based intervention involved a 15-25 minute discussion session, followed by self-determined use of the TV monitor at home over four weeks. The intervention evaluated by Robinson (1999) included 18 classroom lessons of up to 50 minutes duration, most of which were taught over a period of two months. It is unclear how long children and their parents had access to the TV monitors at home; outcomes data were collected six months after baseline measurement. In comparison, the 'Eat Well and Keep Moving', 'Know Your Body' and 'CATCH' interventions (Gortmaker *et al.*, 1999; Luepker *et al.*, 1996; Walter *et al.*, 1988) were provided over two, five and three school years respectively. In these interventions, the classroom component was delivered throughout the school year and varied from 50 minutes every four weeks to two hours a week. In the first two of these interventions, post-intervention outcome data were collected within six months of the end of the intervention. 'CATCH' evaluations continued to follow children up annually for a further three years.

The four school-based interventions included additional components aimed at increasing physical activity. All four used some form of teacher training and materials designed for children to take home to encourage family participation. Two ('Know Your Body' and 'CATCH') aimed for a greater level of family involvement and invited family members into the school to participate in 'family exercise days' and 'family fun nights'. The 'Know Your Body' intervention also had a bio-feedback component, where children were given details of their own level of health as measured by various cardiovascular indicators (e.g. pulse-rate after exercise, blood pressure). The 'CATCH' programme included modifications to PE lesson content and school meals.

In terms of the impact of these different interventions, all five were found to be effective in modifying one or more behavioural or motivational physical activity outcomes for children. Fuller descriptions of these studies are provided below, and in tabulated form in appendices B and C.

i) Ford et al. (2002)

This study reported a pilot RCT to evaluate the effectiveness in reducing TV viewing among African American children aged 7 to 12 of two primary care interventions: counselling alone versus counselling with a behavioural intervention. Families in both groups received a brief counselling session, which included a discussion of the potential problems associated with excessive media use. The hypothesis was that the behavioural group would show greater reductions in children's viewing time and number of meals eaten in front of a TV, and greater increases in physical activity levels.

The development of the intervention was informed by a normative needs assessment, and based on social cognitive theory. No mention was made of involving either children or intervention providers in intervention development. The population group of African American children had been identified in previous research as one at greater risk of obesity and with higher rates than their peers of TV viewing. The study was conducted at an urban community clinic serving a low-income population in Atlanta, Georgia. Authors gave no indication of how the clinic was chosen. Participants were allocated to the different trial arms using random

numbers in opaque ordered envelopes. Signed assent was given by both parents and children. The counselling intervention was provided individually at the clinic to each family; it followed a prepared script and lasted five to ten minutes. The authors did not state who provided the counselling. In addition to counselling, the behavioural group received a 15 -20 minute discussion session, which covered setting TV viewing 'budgets'. Parents were given a brochure about how to reduce children's TV viewing which included three instructions to help parents; identify how much time children spend watching TV and video-tapes and playing video-games; choose a weekly media 'budget'; and help children stick to their budget. Parents were also given electronic TV time managers with personal identification codes for each member of the household.

Fifteen families were randomised to the behavioural group and 13 to the counselling alone group. Both groups were shown to be equivalent across all baseline measures. Analysis of outcome data was conducted on an intention-to-treat basis. Three families in the behavioural group were lost to follow up - two had their telephones disconnected and could not be contacted and one withdrew. The primary trial outcome was children's typical weekday TV, video, and video-game use. Children and parents reported on both this and overall household TV use; the mean number of days when breakfast and dinner were each eaten in front of the TV; the mean weekly hours children played outside and participated in organized physical activity. Outcome data were collected four weeks after the beginning of the intervention.

A limited amount of evaluation was conducted on the processes involved, relating to the acceptability and implementation of the TV time manager, which was rated as 'helpful' or 'very helpful' and easy to use by 10 of the 12 families in the behavioural group who used it. The authors concluded that the behavioural intervention group reported a statistically significant increase in organised physical activity compared to the counselling alone group. A small to medium positive effect was seen for all other pre-stated outcomes, but the data were not statistically significant. The effects on physical activity levels suggested that the behavioural intervention may be more effective, but for all other outcomes the effect was unclear.

This study does provide useful insight into two promising primary care interventions. However, as a small pilot study it lacked sufficient statistical power reliably to show any effect, and the intervention content and delivery would be difficult to replicate from the information given. The evaluation was conducted as a comparison trial and would have been better designed as a three-arm trial, with a control group receiving no intervention.

ii) Gortmaker et al. (1999)

This was a controlled trial conducted in Baltimore, USA. It evaluated the impact on diet and physical activity among public elementary school children of a school-based 'interdisciplinary' intervention. The 'Eat Well and Keep Moving' intervention was designed to be low cost and sustainable; it aimed to decrease consumption of foods high in total and saturated fat, increase consumption of fruits and vegetables to five-a-day or more, reduce television viewing to two hours per day, increase moderate and vigorous physical activity, and expand children's knowledge about healthy eating and physical activity.

The programme was developed through formative research involving focus groups with students and interviews with principals, system administrators and teachers.

The aim was that the intervention be integrated into existing school structures and curricula. It is not clear whether the intervention or its components were actually piloted before full implementation.

The programme, which was based on social cognitive and behavioural choice theory, was launched in the autumn of 1995 and continued for two school years. Students receiving the intervention were aged nine years at its start; they came from low-income families, 90% of those participating at baseline were African-American, and 14% had been held back in class in the previous year.

The intervention centred on classroom-based healthy eating and physical activity units which were integrated into a range of curriculum areas, including mathematics, science, language and social studies. There were also a series of PE lessons focused on nutrition issues, using a 'safe workout' format, and classroom-taught lessons with a physical activity theme, involving students in movement. Lessons used printed cards to introduce students to items on the menu of the school food service. Classroom teachers attended one day of hands-on teacher training and two staff 'wellness' meetings each year. Students were given take-home campaign activities to involve family members. These focused on increased walking, promoting fruit and vegetables ('Get 3-at-school and 5-a-day') and limited television viewing time ('My TV unplugged'). Parent liaisons at schools were linked with organisations providing low-cost nutrition and physical activity programmes to parents.

The intervention was implemented in six schools. We are told that a further eight 'matched schools' were selected as a control prior to implementation and that there were plans to provide these schools with the intervention after the study period. No information is given about how the schools were selected. Informed consent forms were sent home with students to parents or guardians. At baseline, 90% of 872 eligible students participated, though there are discrepancies in the text between different reports of numbers. The authors state that the groups were very similar at baseline, but tables provide means only, with no measures of variation within the sample.

The behavioural physical activity outcomes measured were hours per day of vigorous physical activity and hours per day of TV or video-game use. These were measured at baseline and after the intervention using self-report questionnaires which teachers read aloud in class. The authors cite their own unpublished study as a measure of the validity of the first of these; the validity and reliability of the TV and video-watching measures are not discussed. Interviews were carried out at follow up with a random sample of students to collect data on physical activity levels over the previous 24 hours. Analyses were done on an intention-to-treat basis and also aimed to take into account the clustering of students within schools and differences between groups at baseline.

The authors also evaluated the programme's implementation by surveying teachers at the start and half way through the intervention. We are not told the numbers of teachers surveyed, but 70% and 80% returned evaluations at the two times. No detail is provided of the questionnaires used. Pupils also appear to have been asked whether they liked the lessons but no methods are detailed for this.

The authors' conclusions about physical activity were that the intervention increased knowledge of healthy activities but that there was no evidence of effect on

behavioural measures. Most (95%) of the teachers surveyed rated the intervention as effective, and 65% of students are reported as saying that they liked the intervention lessons.

The reviewers' judged that this evaluation was conducted and reported well enough for them to be able to accept the authors' conclusions about effectiveness for physical activity outcomes. The authors discuss the potential limitations of their study design, and the reviewers agreed with their conclusion that the observed results could reflect unmeasured baseline differences because schools were not randomly allocated to baseline and control conditions. The authors were also concerned with the limited validity of their measures of physical activity, which were dependent on student reports of their own behaviour. The level of loss to follow-up could also cause some concern (approximately 60% of the students present in the study at baseline did not provide follow-up data), although this needs to be seen in the light of the length of the intervention (two school years). However, if this intervention is truly inexpensive (no information is given about implementation costs) and sustainable, it could be a useful way of increasing children's knowledge of the benefits of physical activity.

iii) Luepker et al. (1996)

The Child and Adolescent Trial for Cardiovascular Health ('CATCH') was an RCT evaluating a school-based intervention aiming to change the eating habits, physical activity patterns and smoking uptake of children. This study has been extensively reported in at least 40 separate journal articles. Starting in 1991, the main evaluation involved children aged eight years at the start of the intervention in schools in four different states of the USA. Over a quarter of participating students were either African American or Hispanic.

The intervention, which was guided by social learning theory, lasted three years and was developed through a feasibility study carried out in the same four states (Hearn *et al.*, 1992; Nader *et al.*, 1983). It involved health-related curricula taught by classroom teachers and changes to school meals and PE lesson content. School meals personnel attended a one-day training session each year, followed by monthly follow-up visits and booster sessions. These aimed to reduce the total fat content of school meals to 30% of energy intake and sodium to 600 to 1000mg per serving. PE teachers were given similar levels of training so as to increase to 40% of class time the amount of 'moderate to vigorous' physical activity in PE. The CATCH classroom curricula included targeting of psychosocial factors and emphasised skill development. In half of the intervention schools, students took home activity packets to complete with their families and gained points on a scorecard if this was done. In these schools families were also invited to 'family fun nights' with dance demonstrations, healthy snacks and the distribution of recipes and games.

Schools were randomly assigned to receive intervention or control programmes. The randomisation method is not described. Fifty-six schools (2989 pupils) were randomised to the intervention and there were 40 control schools (2117 pupils). Baseline data were collected before randomisation. Considerable efforts were made to keep track of the study students during the intervention's three years and over an additional three-year follow up period. Almost 80% provided outcome data immediately following the intervention, and 72% at the three-year follow up (response rates were similar in intervention and control groups). Outcome data are presented for all students present at baseline and are reported separately for

intervention and control groups. The authors state that there were no significant differences in outcome measurements at baseline between participants and those subsequently lost to follow-up. While younger, or larger, or African-American students were more likely to drop out of the study, this effect was similar in the two groups. An intention-to-treat analysis was conducted, taking into account allocation by school and with adjustment for baseline differences.

The study measured school meal and PE lesson content, physiological outcomes, students' physical activity and diet behaviour, self-efficacy, perceptions of social reinforcement and support, and dietary intentions and knowledge. Physical activity behaviour was assessed using a self-administered checklist for selected leisure time physical activities, TV watching and video-games. Self-efficacy and social perceptions were measured with a self-administered questionnaire. Both questionnaires had been validated by the authors in previous studies.

The processes involved in implementing the intervention were also evaluated. Teachers and food service staff were interviewed about the acceptability of the intervention and their confidence in their own ability to implement changes; staff participation in training and family participation in the home curricula were monitored and observations carried out of teaching, PE lessons and participation in school lunches.

The authors report that total minutes of reported physical activity were not significantly different between groups at the end of the intervention, but vigorous physical activity (reports of time spent 'breathing hard') was significantly higher in the intervention group. This difference remained at all three of the additional yearly follow-up points. Intervention school students also had significantly higher levels of self-efficacy at the end of the first year of intervention, though this difference disappeared at the later follow up points. Perceptions of social support for physical activity were higher in the intervention group at one and at two years but not later. In terms of outcomes at the school level, the intensity of physical activity in PE lessons increased significantly more in intervention than in control schools, although this effect was not seen during all semesters.

A detailed account is given of the process evaluation. Participation in training was high, with 94% of PE specialists and 87% of classroom teachers attending training. Teachers reported teaching more than 95% of classroom sessions and this was corroborated by classroom observations in which more than 86% of lessons were taught without modification. In addition, teachers are described as thinking that curriculum activities would be effective in changing behaviour. School staff all reported high levels of confidence in their own ability to deliver the intervention.

The evaluation's design and implementation was considered to be sufficiently sound for the reviewers to agree with all the authors' conclusions about effectiveness. The intervention and the evaluation were also well described, meaning that others could replicate both. The reviewers considered that the intervention had long-term effects on children's levels of vigorous physical activity and effects, at several, but not all points during the intervention, on levels of peer acceptability and self-confidence about physical activity and on the kinds of PE students were experiencing in school. Results were not presented separately for the 'school only' and 'school and home' CATCH intervention groups. It was therefore not clear to the reviewers what

additional effect, if any, the components of CATCH involving families may have had on children's outcomes.

The CATCH trial was designed with a physiological measure (concentration of cholesterol in blood serum) as the primary outcome at the individual student level; the power calculation was done using this and targets for changes in PE lessons and school lunches. It is therefore possible that this aspect of the study's design reduced its power to measure effectiveness in terms of self-reported physical activity levels, self-efficacy or perceptions of social support. The reviewers noted that the study of self-reported physical activity levels would have benefited from measurement at baseline, so that the equivalence of the intervention and control groups with regard to this measure could have been examined directly. Overall, reviewers considered the CATCH trial an extremely well designed and well-conducted study that examined both the effectiveness and implementation of a three year, multi-component intervention aiming for changes in school practices and individual student behaviour.

iv) Robinson (1999)

Robinson conducted a cluster RCT to evaluate the effectiveness on children's adiposity, dietary intake and physical activity of a programme aimed at decreasing media use. The study was carried out in San Jose, California, USA, in 1996 with 227 children aged 8 to 10 years in two public elementary schools which were matched on socio-demographic and educational characteristics. The two schools were randomly assigned, one to receive a programme designed to reduce TV, video-tape, and video-game use, and the other to receive no intervention. Most (70%) of the children were described as 'white'; 45% of the parents of intervention group children, twice that in the control group, were college graduates. Neither the children nor their parents nor the teachers were involved in developing the intervention, which was not based on a needs assessment.

The intervention consisted of 18 hours of classroom time over six months, with most of the lessons being taught by ordinary class teachers in the first two months of the school year. Early lessons included self-monitoring and self-reporting of media use, to motivate children to want to reduce the time they spent on these activities. These were followed by a 'television turnoff', during which children were challenged to watch no television or video-tapes and play no video-games for 10 days. After the turnoff, they were encouraged to follow a seven-hour per week 'budget'. Additional lessons taught children to become 'intelligent viewers' by using their viewing and video-game time more selectively. Several final lessons enlisted children as advocates for reducing media use. The intervention had a home component, in which parents, who were given electronic TV time managers, acted as intervention providers by controlling and maintaining their children's media use budgets. Parents were also given newsletters designed to motivate them to help their children stay within their time budgets, and which suggested strategies for limiting the entire family's media use.

The author does not say how the two schools were chosen or how they were randomised. Parental (but not children's) consent was sought, and 87% of the 227 children randomised received parental consent and participated in the trial. Analysis of outcomes was on an intention-to-treat basis. The attrition rate was low, with only three children in each group lost to follow up. Outcome data were collected up to one month after the intervention had been completed.

The primary outcome of the study was body mass index. Other physiological measures were collected and children undertook fitness tests. Both parents and children reported behaviour measures. Parents reported on their children's media use, general household TV use, the number of meals and snacks consumed in front of the TV, other sedentary behaviours, and physical activity levels. Data were collected from parents by means of telephone interviews carried out by trained interviewers using a standardized protocol. Children reported on their weekly media use, the number of meals and snacks consumed in front of the TV, their consumption of high-fat foods and highly advertised foods, their sedentary behaviour and out-of-school physical activity levels. Data were collected from children by means of questionnaires, which were read out loud by trained staff for children to complete.

The intervention was not based on a needs assessment. The process evaluation was limited to implementation of, and participation in, the intervention. However, little information is given about how the process data were collected.

The author presents data which show the intervention to have been effective for a number of outcomes. Both children and parents reported that the intervention significantly reduced TV viewing hours per week, and significantly decreased the number of meals eaten in front of the TV. Intervention group children reported a significant reduction in video-game playing compared to controls, though this difference was not reported by parents. No statistically significant differences were found between the two groups' reported physical activity levels.

The methods employed by the researchers in the conduct of the trial and its analysis were of a high standard, with all analyses completed on an intention-to-treat basis, and blinding of outcome assessors. A power analysis showed that the study had a 90% power to detect an effect size of 0.20 or greater in media use. However, it was not reported whether the study had sufficient power to detect significant differences in physical activity and dietary measures. The intervention content and delivery of the intervention were judged by the reviewers to be replicable. The reviewers consider that this study indicates that classroom lessons supplemented by family access to a TV-monitor can be an effective approach to reducing TV, video-tape and video-game use but that the effects of this intervention on physical activity levels are unclear.

v) *Walter et al. (1988)*

The 'Know Your Body' programme was a five-year school-based intervention, which aimed to promote nutrition and physical activity and prevent smoking amongst children aged nine years old (at the start of the study) living in the Bronx district of New York. The overall objective was to reduce the young people's risk for developing coronary heart disease and cancer. The evaluation design was an RCT.

The intervention underwent pilot testing in several studies. Based on elements of the PRECEDE health education planning model, it comprised teacher-led classroom education, parental involvement activities, and risk factor examination. Throughout the school year students received two hours a week of education on healthy eating (encouraging a diet of reduced fat, cholesterol, sodium and sugar), promotion of physical activity (endurance exercises to build skills and strength), and targeting of beliefs and attitudes concerning smoking. Parents were sent newsletters to inform them about these activities and to advise them on how they might best support their children in initiating and maintaining healthy behaviour. Other activities which involved the parents included food surveys, family exercise days and evening

seminars. The third component of the intervention was a risk factor examination in which students' height, weight, skinfold thickness, blood pressure, post-exercise pulse rate and cholesterol levels were measured, and the results fed back to them, with teachers then discussed with pupils these results in order to set behavioural goals before a second screening.

All eligible schools agreed to participate. Fifteen schools (1590 students) were randomised to the programme, and eight schools (693 students) participated as controls, who received only the risk factor screening component (results were sent to students and parents by mail). Most of the students were Black or Hispanic. After five years of intervention, 66% of participating students provided follow up data. It is reported that those lost to follow-up did not differ significantly in terms of risk factor and knowledge scores from those remaining. In addition to dietary and physiological outcomes, students' knowledge and attitudes were measured in a classroom questionnaire. Baseline measurements were taken. There was some evaluation of the processes associated with the intervention; trainers observed each of the teachers to determine their competence in implementing the curriculum.

Results are expressed in terms of net changes in outcomes, that is, the difference between study groups. A net change for the intervention group is the increase or decrease in an outcome minus that of the control group. There was a net mean increase in knowledge scores of 19%. No detailed process data are given, though it is reported that the ability of the teachers to teach the curriculum effectively varied widely. Difficulties were experienced with school administrators, who were reluctant to take time away from the standard curriculum and some of whom objected on philosophical grounds to the intervention being implemented in a school setting. It was also noted that the enthusiasm of parents and students waned as students progressed into junior high school. The risk factor examination, one of the staple features of the intervention, was considered to have created considerable disruption of regular school activities, and it was felt that its potential as an educational tool was not fully realised.

The study was judged by the reviewers to be methodologically sound, although it was noted that the impact of the intervention on children's attitudes was not reported. Given the five-year duration of the intervention, loss to follow-up in the population was relatively low. The reviewers therefore agreed with the authors' conclusions about the effectiveness of this intervention.

6. IN-DEPTH REVIEW: CHILDREN'S VIEWS

Outline of Chapter

The focus of this chapter is the non-intervention research carried out in the UK which was included in the in-depth review: those studies which sought children's or their parents' descriptions of what helps them to be physically active and what obstacles prevent this. The chapter describes:

- *the characteristics of the children and/or parents studied;*
- *the methodological attributes and quality of the studies; and*
- *a synthesis of the studies' findings.*

Detailed structured summaries of each study follow the results. Appendices D and E contain more systematically ordered information.

For this chapter:

- ***practitioners, policy specialists and families** are likely to derive most benefit from the findings of the children's views studies outlined in sections 6.4 and 6.5; and*
- ***researchers and research commissioners** will find useful the description in sections 6.1 to 6.3 of the characteristics and methodological attributes of studies. The description of study methodology highlights the areas in which research seeking children's views could be improved.*

Key Messages

- *Five non-intervention studies met our inclusion criteria for in-depth review.*
- *Studies surveyed children (or parents) in several sites across the North and South of England, and in the Midlands. No studies conducted in Scotland, Northern Ireland or Wales were identified.*
- *The findings from the studies were obtained from at least 650 children aged 5 to 11 years, and at least 38 parents.*
- *All but one of the studies were based in schools.*
- *Most studies presented some information on their sampling procedures and data collection tools.*
- *The only characteristics of the participating children consistently reported were age and sex; details of social class and ethnicity were less commonly reported.*
- *A variety of data collection methods were used and some studies used more than one method; all the studies gave at least some detail about the questions that children were asked.*

- *As methods of analysis were generally very poorly described, reviewers had doubts about all of the studies regarding their use of appropriate methods to ensure the data analysis was driven by children's own perspectives.*
- *Only one study actively involved children in the design or conduct of the study.*
- *None of the studies' authors said it is important to find out children's views because these are inherently valuable, and children have a right to be heard.*
- *None of the studies met more than nine of the 14 methodological quality criteria identified in this review as an approach to assessing the trustworthiness of findings from 'qualitative' research.*
- *A total of 20 interrelated barriers to physical activity were identified by children and parents.*
- *A total of 14 interrelated facilitators of physical activity were identified by children and parents.*
- *These barriers and facilitators clustered around three specific themes: 'preferences, priorities and values', 'family life and parental support', and 'access'.*

As described in chapter 3, 14 of the non-intervention studies were coded as seeking children's (or parents') views on physical activity. Only five of these met our inclusion criteria for in-depth review (outlined in chapter 4). Six studies were excluded because they did not examine children's (or parents') views on physical activity beyond the PE lesson (Aggleton *et al.*, 1998; Birtwistle and Brodie, 1991; Duda *et al.*, 1992; MacGregor *et al.*, 1998; Mayall *et al.*, 1996; Read, 1995). Two studies were excluded because they were not judged by reviewers to have 'privileged' children's or parents' views (Colley *et al.*, 1992; Wardle *et al.*, 2001). A further study was excluded because it was published before 1990 (Eiser *et al.*, 1983). No studies dropped out because they failed to provide basic information on research questions, methods of data collection or characteristics of the study sample.

The five included studies represent just over 3% of the 90 studies identified in the mapping exercise. The studies were difficult to find through usual bibliographic routes. Four were identified only through searches on specialist health promotion registers (three on the EPPI-Centre's BiblioMap, one on the HDA's HealthPromis database); and one was found through contact with the author. Publication dates ranged from 1995 to 2000. Two studies were each described in two separate reports (Mulvihill *et al.*, 2000a and; Mulvihill *et al.*, 2000b, hereafter referred to as Mulvihill *et al.*, 2000, and; Palframan, 1997 and; Tuxworth, 1997, hereafter referred to as Tuxworth, 1997). Studies were published in a variety of formats. Three were stand alone reports (two of these were subsequently written up for publication as journal articles) and two were published in academic/practice journals. Because some journals have considerable length constraints, we made every attempt to trace the most detailed reports in order to assess fairly the methodological quality of studies.

The rest of this chapter describes the health focus, context, sample characteristics and the methodological attributes and quality of the five studies included in the in-depth review (Burrows *et al.*, 1999; Davis and Jones, 1996; Mason, 1995, Mulvihill *et*

al., 2000, Tuxworth, 1997). We then present and synthesise the substantive findings of the studies – what they reveal regarding children’s (or parents’) views of the barriers to, and facilitators of, children’s participation in physical activity. The section ends with a detailed description of each study.

6.1 Focus and content of studies

Although all the studies focused on physical activity, there were some differences in emphasis between them. Mulvihill *et al.* (2000) was focused on physical activity in its broadest sense (as encompassing sport and exercise as well as more unstructured activities such as walking to school). The researchers in two studies used the terms ‘exercise’ and ‘sport’ to describe their focus of interest to participants, even though they did claim to be concerned with a broader concept of physical activity (Burrows *et al.*, 1999, Tuxworth, 1997)). The study by Mason (1995) was specifically focused on ‘sports’ and ‘PE’. The primary focus of the study by Davis and Jones (1996) was on physical activity in the context of transport.

Three studies reported carrying out the research explicitly to inform the development of specific interventions to promote children’s participation in physical activity. Funded by the Sports Council, the study by Mason (1995) was part of a wider research programme set up to help this agency develop policies for improving sporting opportunities for young people. Mulvihill and colleagues (2000) were funded by the HDA to inform this organisation’s ‘Active for Life’ campaign. The results of Tuxworth’s (1997) study fed into the development of a ‘fitness strategy’ in a rural town to promote physical activity participation. No links to particular interventions or policies were reported by Burrows *et al.* (1999) or Davis and Jones (1996).

The authors of three studies offered a rationale for why they considered it important to examine children’s views (Burrows *et al.*, 1999; Davis and Jones, 1996; Mason, 1995). For example, Davis and Jones (1996) explained that their research is built on the call to make children’s voices heard in order to provide practical ideas for making local environments more child-friendly. In her study, Mason (1995) argued for the exploration of children’s views about sport in-depth in order to ‘improve our understanding of the personal and social influences which affect their involvement’. Interestingly, no authors stated that it was important to examine children’s views because these are inherently valuable and children have a right to be heard. Two studies offered no explicit rationale as to why it might be important to examine children’s views (Mulvihill *et al.*, 2000; Tuxworth, 1997).

One study focused directly on parents’ views (Mulvihill *et al.*, 2000) and another presented data on parents’ views, even though the study did not explicitly aim to do this (Mason, 1995). The views of parents were elicited in the former study because the authors believed that parents ‘often play a key role in influencing how active their children are’ and thus ‘it was considered important that their views should also be elicited’ (Mulvihill *et al.*, 2000a, p. 168). Authors in the latter study reported that parents ‘sometimes took part in the interview, helping the child with some answers’ (Mason, 1995, p. 2). (In such cases, reviewers took these to be parents’, rather than children’s, views.)

6.2 Characteristics of children and/or parents included in the studies

Studies surveyed children (or parents) in several sites across Northern and Southern England and in the Midlands (Mason, 1995; Mulvihill *et al.*, 2000) or in specific locations within England (Davis and Jones, 1996; Tuxworth, 1997). One study gave no details as to where in the UK it was carried out (Burrows *et al.*, 1999). No studies conducted in Scotland, Northern Ireland or Wales were identified. All but one of the studies (Mason, 1995) used school samples and collected data from children at school. Sample numbers ranged from 17 (Mason, 1995) to 405 (Tuxworth, 1997).

The only characteristics of the participating children consistently reported were age and sex. None of the studies involved samples with the exact age range of the present review (4 to 10 years). Two examined 6 to 11 year olds (Burrows *et al.*, 1999; Mason, 1995) and one, 5 to 11 year olds (Mulvihill *et al.*, 2000). A sample of 9 to 11 year olds was studied by Davis and Jones (1996), and 9 year olds made up the sample in the study by Tuxworth (1997). Boys and girls were represented in all five studies, although Burrows and colleagues (1999) reported that most of their sample were girls.

Details of social class and ethnicity were less commonly reported. No studies clearly described the social class of their samples, although two studies gave an indication. Davis and Jones (1996) described their sample in broad socio-economic terms (e.g. lower income levels and higher unemployment levels than the average for Birmingham) and selected from schools in areas with densely populated terraced housing. Mason's sample (Mason, 1995) was 'diverse' in terms of socio-economic background. The children who took part in the study by Burrows and colleagues (1999) came from five state and five private schools (two of these were single sex girls' schools). The children in the study reported by Mulvihill and colleagues (2000) were all considered by their teachers to be either 'active' or 'very active'. The characteristics of parents who participated in one study (Mulvihill *et al.*, 2000), and who helped their children complete answers in another (Mason, 1995), were not described at all.

6.3 Methodological attributes of the studies

This section describes the methods reported in the five studies. The details given varied considerably. Most studies presented information on their sampling procedures and data collection tools, although this information varied in terms of how systematically it was presented and in the level of detail provided. Methods of analysis were generally very poorly described. The degree to which methods are reported is likely to reflect in part each report's publication status: whether it is a report for a primarily academic audience or a report for a wider audience; and whether the report is published in a journal with strict length restrictions or as a single document, with more space, for example, for appendices and illustrative tables or quotes. Three of the five reports were secondary reports published primarily for health promotion or education practitioner audiences (Burrows *et al.*, 1999; Davis and Jones, 1996; Tuxworth, 1997). The study by Mulvihill and colleagues (2000) was published both in journal and full report form, and Mason's (1995) study was published as a full report only.

Although all the studies gave some indication as to how they identified children to sample, little information was presented on sampling frames. For example, when schools were used to identify children, detail on how these schools were chosen and how they were recruited was generally absent. The methods used to select participants from sampling frames varied across the studies. All pupils within a given year group were included in the study sample in two studies (Burrows *et al.*, 1999; Davis and Jones, 1996). Teachers' advice was sought in identifying suitable pairs or 'non-antagonistic' groups of children in two studies (Davis and Jones, 1996; Mulvihill *et al.*, 2000). In another study, data collectors were advised to select a sample quota representative of age, sex and 'keenness on sport' (Mason, 1995). No exclusions or drop outs were clearly reported in the studies, although it was noted by reviewers that in one study students with low literacy could have been excluded if they had difficulty completing the questionnaires used (Burrows *et al.*, 1999).

A variety of data collection methods were used, and some studies used more than one method. Two studies used a self-completion questionnaire (Burrows *et al.*, 1999, Tuxworth, 1997); one study, focus groups (Davis and Jones, 1996); one study, interviews (Mason, 1995); and one used both focus groups and interviews (Mulvihill *et al.*, 2000). Two studies also employed the 'draw and write' technique combined with self-completion questionnaires (Burrows *et al.*, 1999) or interviews (Mulvihill *et al.*, 2000). All studies gave at least some detail about the questions that children were asked. Four studies gave explicit details of the questions (Burrows *et al.*, 1999; Mason, 1995; Mulvihill *et al.*, 2000; Tuxworth, 1997). The remaining study only gave an indication of topic areas (Davis and Jones, 1996).

At least some attempt to establish the reliability or validity of data collection tools was described in all five studies. A variety of strategies were used with some studies using multiple strategies. Burrows *et al.* (1999) and Mason (1995) used a prepared script, and the latter study also used prompts after initial responses were elicited from participants. These techniques strengthened reliability, in that instructions for completing questionnaires and questions to be asked were provided consistently to respondents. Using prompts after children have identified initial thoughts ensures that all possible themes are explored consistently with each participant. In two studies, responses from children were given with assistance from parents (Mason, 1995) or with help from sports officers (Tuxworth, 1997). Two studies described attempts to ensure that children understood that their contributions would be either anonymous or treated in confidence (Mason, 1995; Mulvihill *et al.*, 2000) and one study described attempts to ensure that the power differences between the children and the researchers were minimised (Davis and Jones, 1996). The studies by Burrows and colleagues and Mulvihill and colleagues were the only ones attempting to establish the validity of their data collection techniques. These authors reported how pilot studies helped them to design tools to be more appropriate for children.

Only minimal detail was provided on how data were analysed in studies. In one study authors did not provide any information on this (Davis and Jones, 1996). For the relatively large-scale survey described by Tuxworth (1997), data analysis involved descriptive statistics to examine proportions of children responding in a particular way and inferential statistics to identify the strength of associations between different responses. Two studies reported analysing their data 'thematically' according to the objectives of the study (Mason, 1995; Mulvihill *et al.*, 2000). The authors of the remaining study analysed their data according to a coding framework derived from an

earlier study with adults (Burrows *et al.*, 1999). Establishing the reliability of the data analysis was mentioned in two studies. This involved two researchers analysing the data independently and comparing results (Burrows *et al.*, 1999; Tuxworth, 1997). Means for establishing the validity of findings from data analysis were not described in any of the studies.

Two aspects of children's active participation in these studies were requests for consent and children's involvement in a study's development. Consent was explicitly requested only from parents in two of the studies (Burrows *et al.*, 1999; Mason, 1995). Mulvihill and colleagues (2000) stated that their participants were informed of their right to withdraw from the study at any time. Children were involved in study development through pilot testing in three studies (Burrows *et al.*, 1999; Davis and Jones, 1996; Mulvihill *et al.*, 2000). As mentioned above, Davis and Jones used a number of methods to ensure that the differences in power between the children and the researchers were minimised; for example, they used a focus group format that would 'encourage a naturalistic dialogue and put the reviewer into the role of facilitator or even listener to [children's] conversation' (Davis and Jones, 1996, p.366).

6.4 Methodological qualities of the studies

As described in chapter 4, we assessed each of the studies according to 14 quality criteria. Seven of these criteria related to the quality of the *reporting* of a study's aims, context, rationale, methods and findings. A further four criteria related to the *strategies* employed to establish the reliability and validity of data collection tools and methods of analysis, and hence the validity of the findings. The final three criteria related to the *appropriateness* of the study methods for ensuring that findings about the barriers to, and facilitators of, physical activity were rooted in children's own perspectives. Taken together, these 14 criteria provide a measure of the extent to which we can be confident about the contribution that a particular study's findings can make to this review.

Table 6.1 shows that the main weakness in the five studies lay in authors adequately reporting the context for their studies, clearly reporting sampling methods and details of the sample, and describing data analysis methods. Whilst four of the studies were judged to have used appropriate data collection methods for helping children to express their views, reviewers had doubts about all the studies' use of appropriate methods for ensuring that the data analysis was driven by children's own perspectives. In nearly all cases, this was because methods of data analysis were not well reported. However, in one study (Burrows *et al.*, 1999), methods of data analysis were considered to be inappropriate as they were driven by adult views. Finally reviewers judged that all but one of the studies had failed to involve children actively in the design or conduct of the study.

Table 6.1: Methodological quality of studies (N=5) of children’s and/or parents’ views

	N
Quality of reporting	
Aims and objectives clearly stated	4
Adequate description of the context of the study	2
Sufficient justification for how the study was carried out	4
Clear description of sampling methods and the sample	1
Clear description of data collection methods	4
Clear description of data analysis methods	0
Sufficient original data presented to mediate between data and interpretation	4
Quality of strategies for enhancing reliability/validity	
Sufficient /some attempt to establish the reliability of data collection tools	4
Sufficient /some attempt to establish the validity of data collection tools	2
Sufficient /some attempt to establish the reliability of the data analysis methods	1
Sufficient /some attempt to establish the validity of data analysis methods	0
Appropriateness of study methods for ensuring findings are rooted in children’s perspectives	
Use of appropriate data collection methods for helping children to express their views	4
Use of appropriate methods for ensuring data analysis was grounded in children’s own perspectives	0
Children actively involved in the design/conduct of study to an appropriate degree	1

None of the studies met more than nine of the 14 criteria. Mulvihill *et al.* (2000) met nine; Tuxworth (1997) met seven; Mason (1995) met six; and Burrows *et al.* (1999) and Davis and Jones (1996) each met five.

6.5 What did studies examining children's views find?

The samples in the five studies included both boys and girls, children from both working class and middle class backgrounds and from different ethnicities, and living in rural, suburban and urban areas. This diversity across studies is important, because it can facilitate the identification of both general barriers and facilitators, and those which may be specific to particular groups of children.

Three studies focused specifically on structured forms of physical activity ('sport' or 'exercise'); one looked at unstructured forms of physical activity (play, walking and cycling); and another examined both types of physical activity.

6.5.1 What do children (or parents) think stops them from participating in physical activity?

All five studies had findings relevant to answering this question. A total of 20 distinct, but often interrelated, barriers were highlighted by children (or their parents) across the studies. Each of the 20 barriers is underlined in the text below.

Children in two studies of mixed sex samples aged 6 to 11 years described not enjoying 'sport' or 'exercise' in general or not enjoying particular types of 'sport' or 'exercise' (Burrows *et al.*, 1999; Mason, 1995). However, it is not clear whether a lack of enjoyment would stop children from taking part in unstructured forms of physical activity. Only one of the studies gave more detail on why the children described not enjoying 'sport' or 'exercise' (Mason, 1995). In the context of talking about what had stopped them from taking part in sport in the past or what they liked or disliked about sport, children identified the following feelings and contexts which resulted in a lack of enjoyment:

- a belief that their particular physique or co-ordination skills were not well suited to a particular sport (e.g. 'I'm too small really' (p.34); 'I just seem to be one of those people that seem to be in the way of the ball' (p.35));
- shame and embarrassment that they had let the 'team' down or as a result of critical comments from friends (e.g. 'If you miss a right easy shot and they laugh at you, you feel sad, and you wouldn't want to play as much' (p.59));
- a frustration with complex or unclear rules, often compounded by having to play a sport before they had time to learn such rules (e.g. 'I get shouted at because I don't know the rules and I don't know where I'm supposed to be' (p.38));
- boredom (e.g. 'Hockey is my least favourite...I just get bored' (p.60));
- playing sport in bad weather (e.g. 'It really puts me off if it's raining' (p.40)).

For some children, such feelings could have one of two consequences for their further participation in sport – they either stopped further (voluntary) participation in sports in general, or they gave up the sports they disliked and participated in others which they felt were more suitable for them (e.g. 'I like running...you don't have to think about any rules or anything' (p.35)).

Mason's study reported how parents saw their children's 'health problems' such as asthma as interfering with their participation in sport. However, their children were

keen to point out that, although such health problems may limit their potential, these did not stop them from enjoying or wanting to participate. Children emphasised how they adapted their participation in sport accordingly (e.g. 'I have asthma. I get short of breath when I have an asthma attack. It just comes on – it's mainly when I'm running. I just stop playing for a while' (p.35)).

Some of the children participating in Mason's study indicated that they just preferred to do other things rather than sport, although this was not necessarily because they did not enjoy sport. The children in three other studies also expressed this view. They found other things more interesting and preferred to spend their leisure time watching TV, listening to music, playing computer games or chatting with friends (Burrows *et al.*, 1999; Mulvihill *et al.*, 2000; Tuxworth, 1997). Mulvihill and colleagues note that the enthusiasm for 'sports' and 'exercise' identified in most of their sample had started to decline for the older girls (aged 10 to 11). Rather than being physically active at break and lunch times at school, they preferred 'just sitting around talking with friends' (Mulvihill *et al.*, 2000b, p. 170). Thirty-four percent of the children in Tuxworth's sample indicated 'a lack of interest in sport' as a reason for not participating in 'sport' or 'exercise' outside of school lessons and 'rather do something else' was the third most common of the barriers identified by the children in the study by Burrows and colleagues.

It is possible that a preference for doing other things links to the identification of 'lack of spare time' by some children in these two studies as a reason for not participating in 'sport' or 'exercise' (6% of Tuxworth's sample identified this as a reason and it was the fourth most common barrier identified by Burrows and colleagues). The children and parents in the study by Mulvihill and colleagues (2000) also described a lack of time as a factor restricting participation in physical activity. Children reported parents working long hours (in domestic work or paid work) and described fathers as often busy with hobbies. Whether friends were participating in 'sports' or 'exercise' was important for some of the children in the study by Tuxworth (1997). For the children who did not participate in 'sports' or 'exercise' outside of school lessons in this study, 7% indicated that the reason they did not do so was because their friends were not interested. When children were asked about reasons for not participating in activities that they would like to do but were not currently doing, 21% indicated that this was because they had 'no-one to do it with'.

The barriers 'a preference for other activities' and 'a lack of time' were identified in samples of mixed sex children aged five to eleven. It is clear, at least in two of the studies, that these samples included children from different socio-economic and ethnic backgrounds and children from rural as well as urban areas. In addition, these barriers are likely to apply to structured and unstructured types of physical activity, as both of these types were covered across the three studies.

Restricted access to opportunities for participating in 'sport' or 'exercise' was identified by children and parents as a barrier in four studies. There were four ways in which access could be restricted: cost of, distance to, lack of safe means of travel to or availability of facilities. In the study by Burrows *et al.* (1999) 'availability of facilities' was the least commonly expressed barrier. Eleven per cent of the children in the study by Tuxworth (1997) indicated 'a lack of money and 7% 'a lack of transport' as reasons for not participating in 'sport' or 'exercise' outside school lessons. Significantly, children from rural areas were more likely than those from urban areas (15% v 2%) to report lack of transport, but were less likely to report 'lack

of money' (2% v 22%). A higher proportion of children indicated 'a lack of money' and a 'lack of transport' (23% and 27% respectively) as reasons for not participating in activities that they would like to do, but were not currently doing, such as tennis, gymnastics or swimming. Similar to the finding by Tuxworth, Mason (1995) reported that children (and parents) from families with lower incomes were more likely to identify cost and lack of local access to facilities as barriers. The parents included in the studies by Mason and by Mulvihill and colleagues also talked about all four of the above types of restrictions in access as stopping their children from participating in 'sports' and 'exercise' as much as they might like to. For example, parents highlighted the often-complex arrangements they had to juggle in order to ensure that their children could get to sports venues safely and on time.

The study by Davis and Jones (1996) focused on the activities children do in their everyday lives, as distinct from structured activity such as 'sport' or 'exercise'. By asking children to talk about how they use and get around their local area (inner-city Birmingham), this study highlighted a very different set of barriers related to access. Children described how the various 'dangers' within their local area restricted their mobility (e.g. cycling, walking) and ability to 'play' outdoors. They identified four distinct barriers: busy traffic (which limited the areas in which they could cycle or walk freely and independently – e.g. 'I'm allowed to go up to the shops with my friend, except what I don't like is the roads there, the cars are coming completely fast round there' (p.368)); the threat of crime (bicycle theft and physical or sexual assault – e.g. 'I would like to go my bike but it gets stolen' (p.368)); the threat of intimidation by older children (e.g. 'it's a bit dangerous because of all the big kids hanging around' (p.367)); the neglect of local play areas such as parks being littered with glass, graffiti and dog mess (e.g. 'I don't go there because it's a bad area, there's dog mess everywhere and people breaking up the slides' (p.367)). As a result children and parents imposed restrictions on children's activity, and children found themselves unable to go very far away from home and/or unable to use local play areas, even if these were very close to home. The children in the studies by Mulvihill and colleagues (2000) and Mason (1995) also spoke about parental restrictions on how far they were able to venture on their own. The parents in these studies emphasised issues of safety and danger in imposing these restrictions. The children in the study by Davis and Jones (1996) expressed an ambivalent view about the use of cars. They saw adults as 'lazy' for using cars to travel short distances, but recognised the distinct advantages of cars for enabling quick and efficient travel.

The relationship between parents' attitudes to, and participation in, 'sport' and 'exercise' and children's participation was evident in the views of parents in the two studies which presented their views. Some of the parents in the study by Mason (1995) and Mulvihill and colleagues (2000) identified their own lack of current participation in, or enthusiasm for, sports and exercise as likely to have put their children 'off'. However, other parents felt that this motivated them to encourage their children to be more active than they are (see the next section).

6.5.2 What do children (or parents) think helps them to participate in physical activity?

Four of the studies contributed findings to answer the question about what children or their parents consider to be factors promoting children's physical activity. Fourteen

distinct, but interrelated, facilitators were identified. Again these are underlined in the text below.

In all four studies, fun and enjoyment were important reasons for children's participation in 'sport' and 'exercise'. This finding was evident in those studies in which 'enjoyment' was one of a number of fixed reasons for participation, as well as in those studies in which children were allowed to express their views in their own words. For example, children spoke or wrote about their enthusiasm for being physically active, emphasising how much fun and enjoyment they had (Mason, 1995; Mulvihill *et al.*, 2000). Eighty-six per cent of a large sample of children indicated that 'enjoyment' was a key reason for participating (Tuxworth, 1997) and 'fun' was the most frequently expressed 'motivator' for children taking part in physical activity in the study by Burrows and colleagues (1999). Some studies explored in more detail what made physical activity enjoyable for children. For those children already engaged in high levels of sport, a sense of belonging to a team, enjoyment of competitiveness, and feelings of achievement all contributed to enjoyment and continued participation (Mason, 1995; Mulvihill *et al.*, 2000). The social aspects of doing physical activity with groups of friends or in teams did not appear to be valued just by those children who excelled in sport. The fact that sport and other types of physical activity provided opportunities for spending time with friends was something which children identified as encouraging them to take part in both organised sports and more informal activities (Mason, 1995; Mulvihill *et al.*, 2000; Tuxworth, 1997).

Keeping 'fit and healthy' and in good shape was identified by children as being a reason for taking part in 'sport' or 'exercise' in two studies (Burrows *et al.*, 1999; Tuxworth, 1997). Across all five studies a common finding was that children linked physical activity with health benefits. This finding emerged in both those studies which directly asked children about the benefits or importance of physical activity for health (e.g. 'To keep fit and healthy do you think physical activity matters?'), and those which did not (e.g. 'Why do you like sport?'). The finding was pervasive regardless of whether the study focused on 'sport' (Mason, 1995); 'physical activity' (Mulvihill *et al.*, 2000); 'exercise' (Burrows *et al.*, 1999); or getting around in the local environment (Davis and Jones, 1996). Across the whole age range (5-11 years) covered by the studies, children spoke or wrote about health benefits such as 'being good for your body' and keeping 'fit and healthy'. They often highlighted what they perceived to be the specific consequences of not being physically active or the characteristics of those who are not physically active (e.g. 'fat': 'lazy'; 'couch potato'). The children in Burrows *et al.* (1999) also indicated that controlling weight was a motivating factor for taking part in 'exercise'.

Burrows *et al.* (1999) noted that boys more often than girls identified 'fun' as a 'motivating factor' for participation in 'exercise'. Girls' comments more described 'keeping in good shape' and 'weight control' as motivating factors. These authors argued that this supports the view that girls may be motivated to take part in physical activity via 'extrinsic motivators' (i.e. as a means to achieving another goal), whilst boys may be motivated by 'intrinsic motivators' (i.e. for the reward of the activity itself). However, Tuxworth (1997) also examined gender differences in these types of reasons for participation and did not find a similar pattern.

A supportive, encouraging and inspiring family was identified by both children and parents as helping children take part in organised or structured sports and other physical activities (Mason, 1995; Mulvihill *et al.*, 2000; Tuxworth, 1997). Eight per

cent of the children in Tuxworth's sample indicated that a reason for their participation in 'sport' and 'exercise' was because their families encouraged them. Children who were very active in sports reported that: their parents had encouraged them from a very early age; being very active was the 'norm' in their family; and that they were inspired by their parents' or siblings' participation in sport. Parents in the study by Mulvihill and colleagues (2000) generally viewed physical activity as being of benefit to children, describing physical, social and psychological benefits and how it prevented boredom. Parents in this study also noted that having their children involved in physical activity made the work of parenting easier. Mason (1995) observed that parents' participation or enthusiasm for sport combined with the provision of practical support from parents appear to most effective for encouraging children's participation in sport. Eight per cent of the children in Tuxworth's study indicated that the opportunity to do things with other members of their family was a reason for participating in 'sport' and 'exercise'. Parents in Mulvihill and colleagues' (2000) study said that being able to drive and having access to a car and a garden helped their children take part in physical activity.

The study by Mason (1995) was the only one to report children identifying physical activity (in this case 'sport') as a way of relaxing or forgetting their troubles. The much wider age group in this study (6 to 16 years) might explain this finding. As the findings for 6 to 10 year olds were not separated out, this particular benefit of sport may have only been pertinent to the older age group.

The descriptions children gave of their sporting activities in Mason's study revealed a desire to have a choice of sports opportunities so that they could choose their own activities in order to match their skill level, physique and preferences. Indeed looking back to the some of the reasons children gave as to why they disliked sport suggests that a lack of enjoyment results when children have to take part in sports they do not want to do. Although the children's preferences for different sports in Mason's study were often gender-specific, some girls did like to play football and some boys enjoyed dance or gymnastics. However, these children and their parents described instances in which children were discouraged from such activities as result of the pervasive attitudes about what is appropriate for girls and boys. Opportunities to take part in different activities were also often gender-specific.

Children in Tuxworth's study were asked to describe the 'sports' or 'exercise' that they normally did outside of school lessons. The most popular sports for nine year old girls were (in order): swimming; running; cycling; football; dance; walking; tennis; aerobics; basket/netball; badminton; and cricket. The most popular sports for boys were: football; swimming; running; tennis; cycling; cricket; rugby; walking; badminton; athletics; and basket/netball. A similar list of activities also appeared when children were asked which activities they would like to do, but which they currently did not do. The most frequent activity mentioned by both boys and girls was tennis.

6.5.3 What ideas do children (or parents) have about how their physical activity might be promoted?

Children and parents were only asked directly for their ideas about how children's physical activity might be better promoted in two studies (Mason, 1995; Mulvihill *et al.*, 2000). Five ideas were identified and all of these related to providing better, and greater access to, facilities for physical activity. The parents in the study by Mulvihill

and colleagues suggested: better provision of facilities such as youth clubs for children to meet, especially in bad weather; cleaning up park spaces and play areas; and improving cycle paths. Both children and parents in Mason's study wished for more extra-curricular activities organised by schools and suggested making school facilities more available outside of lesson time.

6.5.4 Summary

Figure 6.1 lists all the barriers and facilitators relating to children's participation in physical activity, and the ideas for promoting this described by children (or parents) across the five studies. The barriers and facilitators clustered around four underlying issues: children's preferences and priorities; the aspects of physical activity that children value; family life and parental support; and access to opportunities for physical activity.

Figure 6.1 shows that no single study identified all the 20 barriers, 14 facilitators or five ideas for promoting physical activity, but some of these were identified in more than one study. Barriers that were identified in two or more studies were: 'not enjoying sport or exercise'; 'preference for other (sedentary) activities'; 'lack of children's or parents' time'; 'parents' lack of current participation in, or enthusiasm for, physical activity'; 'the cost of taking part in sports and other activities'; 'the complexity and burden of organising safe travel to facilities'; 'the availability of local facilities'; 'busy traffic'; 'parental restrictions'; and 'neglect of local play areas'.

Comparing the barriers and facilitators identified across studies highlights two important issues: firstly, the extent to which particular barriers and facilitators are identified either by specific groups of children or by children more generally; and, secondly, those barriers and facilitators which are specific to particular types of physical activity. With respect to the first issue, the only barriers or facilitators that appear to be more pertinent to particular groups of children are 'the cost of taking part in sports and other activities', which was more likely to be identified by children and parents from families with lower incomes; and 'lack of transport' and 'availability of local facilities', which were more likely to be described by children living in rural areas. Specific barriers arising from actual or perceived dangers in children's local areas were only documented in one study involving mainly working class children living in a large city. But parental restrictions on children's freedom of movement because of parental fears about children's safety were identified in more general samples of children, too. All other barriers and all the facilitators were described by children more generally.

With respect to the second issue, some barriers and facilitators are clearly specific to particular types of physical activity. For example, some of the ten barriers related to restricted access (for example, busy traffic) may be most applicable to unstructured types of physical activity such as walking, cycling or playing outside. On the other hand, reasons for not enjoying physical activity tend to be most related to structured physical activity such as sport and exercise.

This framework of barriers and facilitators is the starting point of the next chapter where it is used to assess the extent to which interventions to promote physical activity amongst children 'match' the factors identified by children as important in

encouraging them to take part in physical activity or obstructing their capacity to do so.

6.6 Detailed descriptions of studies examining children's views

This section of the chapter describes each of the five studies in detail. An 'at-a-glance' summary of each individual study's methods and findings can be found in appendices D and E.

i) Burrows et al. (1999)

As part of a larger study of leisure-time physical activity amongst children, Burrows *et al.* (1999) aimed to examine children's beliefs about exercise with a view to identifying negative beliefs to counter through physical activity promotion strategies. The authors thought it important to access children's beliefs 'in their own words' (p. 63) and to achieve this they employed the 'draw and write technique'. An open-ended question – 'Is there anything you would like to write or draw about exercise?' – was posed at the end of the questionnaire used in the larger study. The authors were particularly interested in exploring gender differences and comparing the beliefs of children with those of adults, in order to assess whether the negative beliefs about physical activity pervasive in adults start to form in childhood.

All 64 schools with children in the relevant age group in the Watford area of South East England were invited to participate in the study. Ten state or independent primary, middle or 'preparatory' schools agreed to take part. Parental consent was sought, and researchers administered the questionnaire in each of the ten schools to children aged 6 to 11 years in the summer term. Using a pre-prepared script, the researcher: described the study to the children; explained 'exercise' as meaning 'things that make you feel a bit out of breath, hot and sweaty which includes things like playing outside, not just organised out of school sport or dancing' (p. 61); emphasised the need for individual responses; and asked the children not to talk while completing the questionnaire.

A total of 680 children completed the questionnaire. Of these, 228 children responded to the open-ended question 'Is there anything you would like to write or draw about exercise?' Seventy-six children provided drawings only, 61 provided a drawing and a written response, 69 provided written comments alone and the response of 22 was that there was nothing they wanted to write or draw. Analysis was based on a subset of children's written comments (74/130, 23 boys and 51 girls); it is unclear how this subset was selected. Children's responses were coded according to whether they reflected one of five 'motivational factors' for physical activity (good shape; health; achievement; weight control; fun) or one of nine 'barriers to participation' (illness, injury, no energy, do not enjoy; rather do something else; time; availability; other). This coding framework was taken from a previous study examining motivators and barriers to exercise amongst adults. The results of this previous study were used as a comparison point. On the basis of this, the authors argue that, on the whole, children 'produced similar constructs to those of adults' (p. 64).

Figure 6.1: Summary of barriers and facilitators identified by children (or parents)

Barriers Children and/or parents described the following:	Facilitators Children and/or parents described the following:
<p>Preferences and priorities</p> <ol style="list-style-type: none"> 1. Not enjoying sport or exercise (V1,V2) 2. Physique, co-ordination skills not well suited to sports (V3) 3. Potential for shame/embarrassment from 'letting the team down' or as a result of critical comments from friends when doing sports (V3) 4. Frustration with unclear and/or complex rules for sports (V3) 5. Boredom with particular sports (V3) 6. Playing sports in bad weather (V3) 7. Preference for other (sedentary) activities (V1, V3, V4, V5) 8. Lack of their own or parents' time (V1, V4, V5) 9. Friends are not interested in 'sports' or 'exercise' (V5) <p>Family life and parental support</p> <ol style="list-style-type: none"> 10. Parents' lack of current participation in, or enthusiasm for, sports, exercise or other types of physical activity (V3, V4) <p>(Restricted) Access to opportunities (For structured physical activity)</p> <ol style="list-style-type: none"> 11. Cost of taking part in sports and other activities (V3, V4, V5) 12. Lack of transport to get to facilities (V5) 13. Complexity and burden of organising safe travel to facilities (V3, V4) 14. Availability of local facilities (V1, V3, V5) <p>(For unstructured physical activity)</p> <ol style="list-style-type: none"> 15. Busy traffic (V2, V4) 16. Threat of crime (V2) 17. Threat of intimidation by older children V2) 18. Parental restrictions (V2, V3, V4) 19. Neglect of local play areas (V2, V4) 20. Recognising advantages of cars for enabling quick and efficient travel (V2) 	<p>Valued aspects of physical activity</p> <ol style="list-style-type: none"> 1. Having fun and enjoying oneself (V1,V3, V4, V5) 2. Belonging to a sports team (for children who do lots of sports) (V3) 3. Sports provide an opportunity to compete (for children who do lots of sports) (V3) 4. Sports provide an opportunity to achieve (for children who do lots of sports) (V3) 5. Opportunities for spending time with friends (V3, V4, V5) 6. Opportunity for spending time with family (V5) 7. Keeping fit and healthy (V1, V5) 8. Weight control (V1) 9. Way of forgetting troubles (V3) 10. Choice of sporting opportunities (V3) <p>Family life and parental support</p> <ol style="list-style-type: none"> 11. Supportive, encouraging and inspiring family (V3, V4, V5) 12. Practical support from parents (e.g. money, transport) (V3, V4) <p>(Greater) Access to opportunities</p> <ol style="list-style-type: none"> 13. Having a car (V4) 14. Having a garden (V4) <p>(Ideas from children and/or parents for physical activity promotion)</p> <ol style="list-style-type: none"> 1. Better provision of youth clubs for children to meet (V4) 2. Cleaning up park spaces and play areas (V4) 3. Providing better cycle paths (V4) 4. More extra-curricular activities organised by schools (V3) 5. Making school facilities more accessible outside of school lessons (V3) <p>Key: (V1) - Burrows <i>et al.</i>, 1999 (V2) - Davis and Jones, 1996 (V3) - Mason, 1995 (V4) - Mulvihill <i>et al.</i>, 2000 (V5) - Tuxworth, 1997</p>

A total of 52 of the children's written comments were coded as expressing beliefs related to 'motivational factors' for physical activity. Their comments were most often coded as expressions of exercise as 'fun' (n=16), keeping you in 'good shape' (n=16) or 'healthy' (n=10), or as a means of weight control (n=8). Only two comments expressed the idea of exercise as giving one a sense of achievement. A larger proportion of the comments relating to 'health', 'weight control' or 'good shape' were expressed by girls, and a larger proportion of the comments coded as expressing exercise as 'fun' were from boys.

Thirty of the children's comments were coded as expressing 'barriers to participation', suggesting that children may 'already negatively construe physical activity' (p. 64). There were no apparent gender differences for barriers. Comments were most often coded as 'motivational barriers' (n=14) such as having 'no energy'; 'do not enjoy'; or 'rather do something else'. Since these kinds of barriers may be central to the problem of low levels of activity in adulthood, the authors suggest their study supports the view that 'major difficulties with participation may appear early in life' (p. 66). Seven comments were also coded as reflecting a 'lack of time' barrier; the authors argue that, compared to adults, this barrier seemed less important for children. Three comments were coded to describe lack of availability of exercise and sport opportunities. This barrier was illustrated by comments such as 'You are not allowed to do cycling' (p. 65). Comments were least often coded as physical barriers such as 'illness' or 'injury' (n=2) or problems with 'availability'. Four comments were coded as expressing 'other' barriers such as '...I do not know where to start' (p. 65).

Reviewers judged this study to have met just one of the seven 'quality of reporting criteria' (a clear description of data collection methods). However, they judged the study more favourably in terms of the quality of the strategies employed in the study for enhancing the reliability and validity of its findings: there had been some attempt to establish the reliability and validity of the data collection tools used, and the reliability of the data analysis. Despite these strengths, the reviewers judged the study to have only met one of the three criteria used to assess the appropriateness of the study methods for understanding physical activity from children's own perspectives. While highly appropriate efforts were made to elicit children's views (i.e. using a 'draw and write technique', piloting questions on a separate group of children), it was noted that the methods of analysis did not take these as the starting point: children's views were coded according to a framework developed on the basis of adult views. The reviewers were therefore not confident that the research had accurately captured the views of children; it may, in fact, have ignored their unique perspective.

ii) Davis and Jones (1996)

This study aimed to explore children's ideas about transport, health and local environmental issues and the relationship between these issues. The authors were particularly interested in discovering from children themselves how they manage contradictory messages about being healthy and keeping safe, being active and avoiding risks, and handling traffic and 'stranger danger' while maintaining a healthy lifestyle. The authors argued that there is a need to make children's voices heard and that 'consultation with children can provide practical and valuable ideas for changing their local environment' (p. 364). Topics for discussion included how children 'get around' and use their local area; what they see as the risks of their local area; and their ideas for change.

Two inner urban and two outer suburban schools in Birmingham, England, took part in the study. Consent procedures were not described, and it was not clear how the schools had been selected or recruited. A total of 138 mixed sex participants divided into two age groups (9 to 11 and 13 to 14 years) took part in an unspecified number of focus groups of six to eight children. Teachers purposively selected participants who were 'non-antagonistic' toward each other. Focus groups were on average 50 minutes long and were tape-recorded. Methods of data analysis were not reported, but the responses of 9 to 11 year olds appear to have been summarised and then compared with those of the 13 to 14 year olds.

When discussing how they got around their local area, children indicated four distinct barriers to independent mobility: busy traffic; the threat of crime; problems with intimidation by older children; and the neglect of local play areas. As a result restrictions on activity were self-imposed and/or parentally enforced. The children also expressed an ambivalent view about the use of cars. They saw adults as 'lazy' for using cars to travel short distances, but recognised the advantages of cars in enabling quick and efficient travel.

The authors made several recommendations, including: initiatives for safe routes to school that encourage children to cycle; cleaning up local parks and establishing park wardens; making environmental changes in conjunction with programmes to change attitudes; and the intersectoral action of healthy alliances with other agencies.

Reviewers judged this study to have met three of the seven 'quality of reporting criteria' (clearly stated aims and objectives; sufficient justification provided for the way the study was done; and sufficient original data presented) and only one of the criteria assessing the 'quality of strategies for enhancing the reliability and validity of findings (authors failed to employ techniques to enhance the reliability of their data collection tools or the reliability or validity of their data analysis methods). In addition, the reviewers judged the study to have only met one of the three criteria used to assess the appropriateness of the study methods for understanding physical activity from the children's own perspective. Although they used an appropriate method for accessing children's views (focus groups encouraging children to contribute 'ideas, tell stories and validate or question the agenda set in the questionnaire' (p. 366)), it was unclear whether data analysis methods were appropriate (as these were not reported) and children were not actively involved in the design or conduct of the study.

iii) Mason (1995)

To complement the results from a 1993 Sports Council funded national survey, Mason sought to understand the personal and social influences on children's involvement in sport. The purpose of the study was to explore children's views on involvement in sport in order to improve our understanding the factors influencing this. Children and young people living in areas close to selected UK primary, middle and secondary schools participated in the study. Interviewers contacted households with the aim of achieving a sample of children which was representative in terms of age, sex and 'keenness on sport' (p. 63). Forty children aged 6 to 15 years (17 aged between 6 and 11 years) were interviewed.

The interviewers used topic guides to collect children's views in open-ended in-depth interviews in children's own homes. Parents were asked for their consent to interview

children, and remained present during the interviews, sometimes helping their child provide answers. Prompt cards were used after eliciting children's first thoughts, to cover topics not yet mentioned but possibly relevant. All interviews were tape-recorded and transcribed. Mason describes identifying the main themes and issues in the transcripts. Themes/issues included 'physique, physical abilities and health'; 'early upbringing and family encouragement when young'; 'peers and friends'. Multiple quotes from respondents were used to illustrate these themes.

In this study, too, both children's choices and the types of sports they were offered were gender-specific. For example, most boys were offered, and preferred to play, football, but dancing was not on the agenda. Children said the support, encouragement and enthusiasm they received from parents, teachers and coaches encouraged them to participate in sports. Parents who participated in sports inspired children to do so as well. Children who enjoyed a high level of sport often described participating from a very young age within the context of an active family. The author concluded that the two most effective factors for encouraging children's participation in sport were parents' own participation or enthusiasm and practical support (e.g. coaching) from teachers. Children described positive peer comments as an influence on their physical activity, and the importance of physical activity as a social activity shared by children and their friends. Children's descriptions of those sports they prefer and dislike suggest that they value having a choice. Having a variety of 'sporting' opportunities was seen as enabling them to choose activities according to their particular needs and according to what challenges them. Parents felt that by recognising and supporting their child's innate abilities and potential, they were helping children to be active.

In terms of barriers to participation, children complained that their physique (e.g. being too small) or their physical abilities (e.g. hand-eye coordination, movement precision, balance) could limit their potential for some sports. As a result some children described giving up sport, but others simply chose other activities to which they felt they were more suited. Children with health problems (e.g. asthma, heart problems, knee problems) recognised that this limited their abilities, although they were still keen to do sport and some had developed ways of adapting to their physical limitations. Children described experiencing the following reasons for being put off sport or particular activities: trying to play games with complex rules or skills when they did not understand the rules/skills to begin with; bad weather; choice of activity, when it was not their own; and peer influence (e.g. when peers were watching and were critical of a child's performance). Children identified issues of access, such as being able to afford activities, having local activities available, travelling long distances and travelling safely alone or after dark as barriers to their participation. The authors noted that these views tended to be expressed more often by children from poorer families. Finally, children described their preference for other activities such as TV, music or computer games as limiting their participation in sports.

Parents saw children's health problems as limiting their physical activity. They thought that children were not introduced to enough variety of sport in school. Parents, like children, identified issues of access as barriers to physical activity. These included the cost of sport, the availability of local facilities, the burden of transporting children to activities and their ability to provide that transport, and concerns about the safety of children travelling alone. Parents also recognised that

their own lack of participation in sport or enthusiasm could affect their children's participation.

Both children and parents in this study wanted more extra-curricular opportunities for children to participate in sports, and they suggested that school facilities be made more available outside of the school PE lesson. Children thought it would be helpful to know more about local extra-curricular sports opportunities available to them.

Reviewers judged this study to have met four of the seven 'quality of reporting criteria' (it did not provide a clear description of context, sampling methods and sample, or data analysis methods) but only one of the four criteria used to assess the quality of strategies for enhancing the reliability and validity of findings (the author had made an attempt only to establish the reliability of data collection methods). The reviewers also judged this study to have met only one of the three criteria used to assess the appropriateness of the study methods for understanding physical activity from the children's own perspective. Although it was judged to have used an appropriate method for accessing children's views (interviews), reviewers noted that the presence of parents may have influenced children's responses. It was also unclear whether data analysis methods were appropriate (as these were not reported) and children were not actively involved in the design or conduct of the study.

iv) Mulvihill et al. (2000a, 2000b)

These two reports of the same study describe using interviews and focus groups with children and parents to explore factors influencing children's involvement in physical activity. The study included children and young people aged from 5 to 16 years, but the findings for 5 to 11 year olds (and their parents) are presented separately in the first report, and are the sole focus of the second. In comparison to previous research on this topic, the authors emphasised their broader focus on 'physical activity' rather than 'sport' or 'exercise' and their adoption of a 'qualitative' approach in order to 'access meanings and understandings relating to physical activity and to allow respondents to discuss their attitudes and experiences in an informal and interactive manner' (Mulvihill et al., 2000b, p. 168). The study aimed to explore a number of specific issues: what children/parents see as constituting physical activity; their preferred physical or non-physical activities; gender differences; the role of the school, friends and family; beliefs about the benefits of physical activity; and barriers and motivations.

Children and parents identified through primary schools in six urban and rural sites in the North, Midlands and South of England took part in the study. Schools were selected purposively to reflect a diversity of socio-economic backgrounds and ethnicity; no details are given on how the schools were recruited. Teachers in these schools were asked to select children for the study in terms of their physical activity levels; no details are given on how parents were recruited (some were not the parents of the children interviewed). Participants do not appear to have been asked for their consent, although they were assured of their right to withdraw from the study at any time and that their data would be reported anonymously.

A total of 60 children (30 boys and 30 girls) aged between 5 and 11 years took part. All were deemed to be either 'active' or 'very active' by their teachers. Children were interviewed in pairs matched by gender and age. This technique was felt to be more supportive and encouraging for children. A detailed guide for the interviews is

presented in Mulvihill *et al.* (2000a). The guide was structured according to the order and content of the specific aims of the study and included activities (e.g. 'draw yourself doing your favourite physical activity'; 'name three things that you like to do') as well as questions (e.g. 'do you think physical activity is important?'; 'what stops you from being more physically active?'). A total of 38 parents, mostly mothers, from the same schools as the children's sample took part in focus groups. Again a detailed guide for the focus groups is presented in Mulvihill *et al.* (2000a). Examples of questions asked are: 'when you think of "physical activity" what comes to mind?'; 'what type of things do you do with your children at the weekends?'; and 'who is more likely to take your child to do physical activities?'.

Interviews and focus groups were recorded and key points transcribed. Data were analysed thematically in order to identify 'the range of views expressed, recurrent themes and the implications of issues for children's orientation towards involvement in physical activity' (Mulvihill *et al.*, 2000b).

The *children* in this study reported high levels of physical activity in a wide range of activities both in and outside school (preferred activities were football (boys only), rounders, swimming, walking, cycling, dance (girls only) and gymnastics). With respect to how children understand or view 'physical activity', the authors concluded that children see it as important both in terms of avoiding the negative effects of not doing physical activity (becoming unhealthy, fat, lazy, idle, not being able to have fun) and in terms of being something from which they get a lot of enjoyment. The social aspects of doing physical activity with friends in groups or teams were highly valued by all children, and feelings of competition were important for boys in particular. Older girls were more likely to prefer sedentary activities.

The children identified very little that stopped them being physically active and the authors argue that they 'appeared well motivated to undertake physical activity and were largely confident about participating in activities' (Mulvihill *et al.*, 2000b, p. 73). However, lack of both their own and parental time (for family-based activities) were identified as barriers. Children reported parents working long hours and fathers often being too busy with hobbies. A minority of children indicated that parents did curtail their physical activity for reasons of safety (e.g. not cycling too far away), expense or to encourage more time spent studying.

In terms of what children think helps them take part in physical activity, children felt that parents encouraged them to go out to play to prevent laziness and to stop them 'getting under parents' feet'. From the children's responses to questions about parents and physical activity, the authors concluded that 'parents had a great deal of influence over levels of physical activity', for example, whether or not children were allowed to walk to school. However, they also note that parents 'generally did not discourage their children from taking part in physical activity' (Mulvihill *et al.*, 2000b, p. 172). From the views of children who were 'very active' the authors identify the following as supporting their high levels of activity 'a heightened awareness of the benefits of being a team member, increased social interaction, an enjoyment of competitiveness and a sense of achievement' (Mulvihill *et al.*, 2000a, p. 26).

Parents perceived their children to be highly active ('always on the go'). They generally felt that physical activity was very important and that it held physical, social and psychological benefits for children. It prevented boredom and made parenting easier because children were occupied. However, some parents felt that supporting

physical activity could create more work, demanding a lot of time, expense, and organisational skills. Rural parents said their location was an influence on children's activity, as they could do more things outdoors. Parents identified the following barriers to children's participation in physical activity: being a lone parent, their own experiences of PE as children, a lack of time and concerns about children's safety, having access to transport, and the poor condition of parks. They suggested that better provision of facilities, youth clubs and cycle paths might help to make children (and themselves) more active.

Since the authors framed much of their study in terms of factors that motivate and inhibit children's physical activity (in terms of, not only children's own attitudes and preferences, but also the behaviour of other people and the physical environment), many of their findings are directly relevant to this review's conceptualisation of barriers and facilitators. Although children were asked directly what they thought could be done to help them improve their physical activity levels, the authors do not report children's responses to this.

Reviewers judged this study to have six out of the seven 'quality of reporting criteria' (it did not provide a clear description of data analysis methods) but only one of the criteria used to assess the 'quality of strategies for enhancing the reliability and validity of findings (authors had made some attempt only to establish the validity of their data collection tools). The reviewers also judged this study to have met two of the three criteria used to assess the appropriateness of the study methods for understanding physical activity from children's own perspective. Although the study was judged to have used an appropriate method for accessing children's views (the 'draw and write' technique and attempts to provide support for children by interviewing them in pairs) and to have involved children activity in the design and conduct of the study, it was unclear whether data analysis methods were appropriate (as these were not reported).

v) Tuxworth (1997)

The study by Tuxworth aimed to examine the physical fitness and lifestyle patterns of children and young people in a town in Suffolk, England. A two-part survey was administered: a battery of tests to examine physical fitness and a 'lifestyle questionnaire' which aimed to reflect the children's opinions and their memories concerning their participation in, and attitudes to, physical activity and other health-related behaviours. In this summary the results of the 'the lifestyle questionnaire' are considered only. The questionnaire included questions on level of participation in 'sport' and 'exercise' within and outside school and reasons for participation and non-participation in sport and exercise

The survey was conducted in schools with 9, 13 and 15 year olds on three separate occasions in the years 1993 to 1995. Schools were not randomly selected but were included because the leisure centre 'had contact with them' (p. 9) or were 'chosen to balance up the sample in terms of age, school location (urban/rural) and socio-economic backgrounds served' (p. 10). Overall 1140 children took part in the survey, including 405 9-year-olds. The survey underwent minor modifications each year to improve its focus on children's views.

Questionnaires were completed in the school setting using the same team to administer the tests at all time points. The older children filled in the questionnaires themselves, whilst the nine year olds completed these with the help of a local Sports

Development Officer. Responses were analysed using descriptive and inferential statistics. Differences in responses according to age, gender and location (urban/rural) were examined.

Children were asked to describe the 'sports' or 'exercise' that they normally did outside school lessons, and those that they would like to do, but currently did not. There were gender differences in both current and preferred participation patterns.

Children who reported not doing 'sport' and 'exercise' outside school lessons were asked to indicate which of a possible six reasons could explain why. The frequencies with which children chose each of these reasons were: lack of interest in sport (34%); lack of spare time (27%); lack of money (11%); lack of transport (7%); friends are not interested (7%); no local facilities (7%). Although these figures reflect the entire age range in the sample, the author did look for differences according to age. Only one difference was found - lack of spare time was reported to be less of a problem for nine year olds, with only 6% giving this as a reason for their non-participation. Children from rural areas were more likely than urban children to report 'lack of transport' as a reason for non-participation (15% v 2%), and children from urban areas were more likely than rural children to report 'lack of money' (22% v 2%). Reasons preventing children from taking part in activities that they would like to do but which they currently did not do were: lack of facilities (27%); lack of money (23%); no-one to do it with (21%); lack of equipment (17%); shyness (5%); activity too demanding (5%). Nine year olds reported lack of facilities, money and no-one to do it with less frequently than older children, and more boys than girls offered lack of suitable equipment as a reason (25% v 12%).

Children were asked to identify their reasons for participating in 'sport' and 'exercise' outside school lessons and were given a choice of five reasons. The frequencies with which children chose each of these reasons were: enjoyment (86%); to keep fit (45%); because their friends were participating (14%); their family encouraged them to (8%); opportunity to do things with other members of the family (8%). No differences were found according to age, apart from with respect to 'keep fit': only 37% of the 9 year olds gave this as a reason for participation.

Reviewers judged this study to have met five out of the seven 'quality of reporting criteria' (it did not provide a clear description of sampling methods and sample or a clear description of data analysis methods), but only one of the criteria used to assess the 'quality of strategies for enhancing the reliability and validity of findings (the author had made some attempt only to establish the reliability of the data collection tools). The reviewers also judged this study to have none of the three criteria used to assess the appropriateness of the study methods for understanding physical activity from the children's own perspective. The study was not judged to have used appropriate methods for accessing children's views (the origin of the fixed response options in the questionnaire was unclear), and children were not actively involved in the design or conduct of the study. Because data collection methods were not judged to be appropriate, data analysis methods could not be judged to be appropriate either. This study seems less well suited than others to capturing children's unique perspectives.

7. SYNTHESIS ACROSS STUDY TYPES

Outline of Chapter

This chapter synthesises the findings from the different sections of the report. This is a particularly challenging exercise, in view of the different types of research included. Specifically, the chapter looks at:

- *The ways in which the barriers to physical activity participation ‘beyond the PE lesson’ described by children (or parents) are similar to, or different from, the barriers addressed in intervention studies.*
- *The extent to which the facilitators of physical activity participation ‘beyond the PE lesson’ described by children (or parents) have been used as the basis of evaluated interventions.*

This chapter will be useful to all audiences. In particular:

- ***Practitioners, policy specialists, children and their families** are likely to find useful the examples of matches, mismatches and gaps between what children and parents say is important for physical activity and interventions. Matches highlight interventions that resonate with children’s views. Mismatches highlight interventions that could match with children’s views but have not been evaluated in a sufficiently rigorous way to enable reliable conclusions to be drawn, or interventions targeting aspects of physical activity that were not identified in children’s views studies, such as multi-component interventions aiming to reduce cardiovascular risk. Gaps highlight areas where no interventions were located that matched children’s views. These suggest promising interventions to build on for future development and evaluation.*

Key Messages

*In terms of **children’s preferences, priorities and valued aspects** of physical activity:*

- *Some children said they did not enjoy sport or exercise and that they preferred to choose which activities they took part in. Two ‘not sound’ outcome evaluations provided personalised fitness modules and a range of activities for children to choose from in a 15-minute activity period.*
- *Children reported that they took part in physical activity because they enjoyed it and valued opportunities for socialising with friends. One ‘not sound’ outcome evaluation offered physical activity in an enjoyable social atmosphere.*
- *Some children preferred to do other things rather than sport such as watching TV, listening to music or chatting with friends. Two soundly evaluated interventions helped children to be aware of, and limit, their sedentary activities. One of the studies showed an effect for decreasing TV viewing but did not measure physical activity. The other study found no effect on TV or video-game use but a positive effect on physical activity levels.*

- *No interventions were located that helped children take part in physical activity as a means of relaxing or focused on making more time available to children to exercise.*

In terms of family life and parental support:

- *Parents' attitudes to, and participation in, sport helped children to be active. All five 'sound' outcome evaluations included components to involve parents (although none measured the impact on parents' attitudes). One 'sound' study evaluated the potential effect of parental participation on children's activity but did not measure uptake and use by children and parents. It did show a positive effect on children's knowledge about physical activity. One 'not sound' outcome evaluation described parents' activity levels in a community-based physical activity programme. Another 'not sound' outcome evaluation encouraged children to ask older family members about their physical activity levels, to heighten children's appreciation of the cultural value placed on physical activity.*

In terms of children's access to physical activity opportunities:

- *No interventions were found that improved families' access to cars and gardens, two facilitators parents thought helped their children to be more active.*
- *Cost and availability of structured physical activities were identified as barriers by children and parents. One 'not sound' outcome evaluation aimed to provide free transportation as a means of improving physical activity levels, and another provided information on free leisure activities for children. A third intervention described in a 'not sound' outcome evaluation aimed to provide school facilities outside of school hours.*
- *Regarding unstructured activities, children identified the neglect of local play areas as a barrier to participation. Two 'not sound' outcome evaluations aimed to make improvements to school playgrounds. These matched requests made by parents for park spaces and play areas to be cleaned up.*
- *No interventions were located that would address influencing factors of threats of crime or intimidation by older children, busy traffic or suggestions made by parents for providing youth clubs and improved cycle paths.*

This chapter synthesises the findings from the different sections of the report, and brings together the different types of research included. Specifically, the chapter looks at the ways in which the barriers to, and facilitators of physical activity participation 'beyond the PE lesson' described by children or parents are similar to, or different from, those addressed in the intervention studies.

The synthesis was carried out by three of the report's authors using a matrix (see Appendix F). This laid out the barriers and facilitators identified by children or their parents alongside descriptions of the interventions evaluated in the outcome studies included in the in-depth review.

As described earlier, the barriers and facilitators identified by children or their parents clustered around the three themes of: 'children's preferences, priorities and valued aspects of physical activity'; 'family life and parental support'; and 'access to

opportunities'. The barriers identified by children or their parents were grouped according to these themes, forming the first column in the synthesis matrix. Facilitators and ideas for physical activity promotion were grouped in a similar way to create the second column.

Interventions evaluated in sound outcome evaluations were then examined to see whether they aimed to address the barriers, or build on the facilitators, described by children or parents. When the intervention appeared to address a barrier or build on a facilitator, it was listed in a third column in the synthesis matrix. The intervention and its effects were described.

When none of the interventions within the set of sound outcome evaluations appeared to address barriers or build on facilitators described by children or parents, those interventions evaluated in studies judged to be 'not sound' were scanned to see whether any matches could be identified. If so, these were listed in a fourth column in the synthesis matrix. As a whole, this approach enabled an assessment of the extent to which intervention research has addressed children's or their parents' views.

7.1 Matching children's views to evaluated interventions: 'preferences, priorities, and valued aspects of physical activity'

Whilst nearly all the children (and parents) recognised the health and social benefits of physical activity, some children simply did not enjoy particular types of physical activity. In particular, children described not enjoying 'sports' and 'exercise'. The importance of choice was highlighted when children described in more detail why they did not enjoy particular (or all) sports. Children liked to be able to choose which activity to participate in to match their particular physique, skills, or health problems. They did not want to participate in activities that they found to be boring or frustrating because of unclear or complex rules; they disliked playing sports in bad weather, and some feared the possibility of critical comments from peers if their 'performance' was not up to scratch. In some cases, these issues led to children ceasing any further participation or they switched to other more suitable sports. Children who were already engaged in high levels of sport wanted to participate in activities that would challenge them to achieve and provide competition.

Two of the views studies provided information on children's preferences for different activities (Mulvihill *et al.*, 2000; Tuxworth, 1997). The most popular sports for girls in both studies were: swimming; running; cycling; football; dance; walking; tennis; aerobics; basketball/netball; badminton; and cricket. The most popular sports for boys were: football; swimming; running; tennis; cycling; cricket; rugby; walking; badminton; athletics; and basketball/netball. Children identified similar activities when asked which activities they would like to do, but which they currently did not engage in. Tennis was the most frequent activity mentioned by both boys and girls.

While no sound outcome evaluations addressed these particular aspects of children's participation in physical activity, two interventions, not soundly evaluated, did do so. The first of these involved children using a 'personalised fitness module', in which they were fed back information about their own fitness levels and were then

provided with a programme tailored to their needs. Within this programme, children were able to select from a range of different physical activities (Mott *et al.*, 1991). It is unclear from the description of the intervention provided how much control children actually had in decisions about what would suit their own physical activity needs. The second intervention described in a 'not sound' outcome evaluation, the 'PLAY' intervention evaluated by Ernst and Pangrazi (1999), trained teachers to provide children with a variety of activities that were enjoyable and easy to do. The children were then free, within a 15-minute daily activity break, to select activities. This intervention is unusual in that it focused primarily on getting children moving more, regardless of the form that this took. The only rules that children had in their breaks were that they should not stand or sit still, unless this was as part of participation in an active setting (e.g. if waiting in line for a turn at a game). Reviewers judged the study unclear in its effects.

An important reason why children take part in physical activity is simply because they have fun and enjoyed it. For some children this enjoyment may be related to opportunities for competition and achievement. For others, enjoyment may be related to opportunities for spending time with friends. Some children value the social opportunities offered by physical activity. Participating in formal sports as well as more informal physical activities (e.g. skipping, cycling, other types of play) allows them to spend time with their friends. Some children indicated that the reason they did not take part in physical activity was because they had no one to do it with or that their friends were not interested. Team sports participation also provided some of the more active children with a sense of belonging. None of the soundly evaluated interventions appears tried to promote physical activity in ways that resonate with these children's views. However, one intervention that has not yet been soundly evaluated may be relevant (Baranowski *et al.*, 1990). A community-based family fitness programme, which aimed to provide an attractive physical and social environment, encouraged socialising amongst participants (not further specified) during the exercise sessions. It is unclear how much this intervention would have built on the value attached by children to taking part in physical activity with friends, as children attended these sessions with their families. No interventions were found that addressed the potential for children as leaders of physical activity.

Some children prefer to do other things rather than physical activity, such as watch TV, listen to music, playing computer games or chat with friends. Additionally, both children and parents cite a lack of time for children to be physically active. Balancing the amount of time children spend being physically active with the amount of time they spend in sedentary activity appears important. Three of the soundly evaluated interventions have some relevance to these aspects of children's views. Two interventions focused on helping children to be selective about and to 'budget' their TV, video and video-game use (Ford *et al.*, 2002; Robinson, 1999). The other intervention included classroom-based campaigns and take-home activities to foster limiting TV viewing time as one component of a larger healthy eating and physical activity strategy (Gortmaker *et al.*, 1999). Reducing the time spent in sedentary activities is a skill that could possibly enable children to get more out of the time they do wish to spend watching TV, while creating more time for other activities (Ford *et al.*, 2002). Robinson (1999) provided a classroom-delivered curriculum on self-monitoring and reporting of TV, video-game and video use, followed by a 10-day home 'TV turn-off' challenge. Gortmaker and colleagues (1999) provided classroom activity units on healthy eating and physical activity, which included a component to reduce TV viewing time.

In summary, the only two barriers that were directly or partially addressed by effective interventions were a 'preference for other (sedentary) activities' and a 'lack of time'. The results of these suggest that helping children to plan and be selective about watching TV and playing video-games can increase time spent in physical activity and reduce time spent in sedentary activity. None of the facilitators described by children were built upon by soundly evaluated interventions, but there were interventions, not soundly evaluated, which did build on the importance of choice and spending time with friends and family. These interventions can be recommended for further development and evaluation. We were not able to match, or even partially match to evaluated interventions, any of the remaining barriers and facilitators described by children in this category. None of the interventions appeared to build on some children's enthusiasm for physical activity as a way of keeping 'fit and healthy', 'controlling weight', relaxing or forgetting troubles, or dealing with peer ridicule during structured activities; and none appeared to address parents' lack of time.

7.2 Matching children's views to evaluated interventions: 'family life and parental support'

Some children appreciated physical activity as an opportunity to do things with other members of their family. All five of the soundly evaluated interventions included components meant to involve families in children's learning about the health benefits of physical activity. Three interventions sent home newsletters either to inform parents about their children's activities, or to motivate them to help children limit their sedentary behaviour. Two of these evaluations showed an effect on children's knowledge; the third evaluation showed an effect for limiting children's TV, video and video-game use. Two interventions included take-home activity packs, family fun nights and exercise days and parental evening seminars. One evaluation showed an increase in children's physical activity; the other showed an increase in knowledge. Two interventions provided TV time managers and either counselled parents directly about TV and video use or provided information on strategies to encourage children to limit this. One evaluation showed a reduction in children's TV use, while the other evaluation indicated an increase in children's physical activity.

However, none of the evaluations examined the impact of these strategies on parents' attitudes or knowledge about children's physical activity. So, while several of the interventions were found to have an effect on physical activity levels or motivating factors, it is unclear whether the parental involvement component was the critical element.

While no studies evaluated the effect of sibling participation in children's physical activity uptake, one soundly evaluated intervention was relevant to the potential effect of parental participation on children's activity (Gortmaker *et al.*, 1999). In this study, information was provided about organisations that offered parents free or low-cost physical activity programmes. However, the uptake and use of these programmes was not examined as part of this evaluation, so it is unclear as to whether they would have enabled parents or their children to exercise. Another evaluation study, deemed not sound, looked at a community-based family fitness programme to improve parents' own activity levels directly (Baranowski *et al.*, 1990).

In one intervention described in a 'not sound' evaluation, children were encouraged to interview older members of their family to ask them about their experiences of physical activity (Davis and Jones, 1996). The authors noted that previous generations of Native American groups involved with this intervention had higher levels of physical activity as children, and that contact with family members and tribal elders might help children learn about the importance of physical activity within their own culture.

Some parents identified their own lack of current participation in or enthusiasm for sports and exercise as a barrier to their children's physical activity. However, other parents felt that this motivated them to encourage their children to be more active than they were. Parents' enthusiasm for sport combined with the provision of their practical support encouraged children's participation in sport. None of the soundly evaluated interventions measured parents' participation levels or attitudes toward physical activity.

Children said that supportive and encouraging families helped to motivate their own participation in physical activity. Children who were active in sports reported parents who had encouraged them from a very early age, said that being active was 'the norm' in their family, and described being inspired by their parents' or siblings' participation in sport. No soundly evaluated interventions were identified to address these aspects of family support.

In summarising this aspect of children's views, all five soundly evaluated interventions sought to involve parents in their children's learning about physical activity, in being physically active or in reducing sedentary activity. However, the effects of these interventions on parents' own motivation and activity were not measured.

7.3 Matching children's views to evaluated interventions: 'access to opportunities'

Children and parents identified barriers of cost, distance and availability related to structured activities such as organised sports. They reported barriers of safety and quality of facilities related to unstructured activities such as cycling or playing games with their friends.

According to children and parents, the cost of (structured) activities limits children's participation in physical activity. Children identified the distance to, or lack of safe means of travel to, and availability of, facilities as barriers to participation. Barriers to unstructured physical activities included busy traffic, the threat of crime and of intimidation by older children, the neglect of local play areas, parental restrictions of how far children can venture alone, and knowledge of the advantages of cars for quick and efficient travel. No soundly evaluated interventions addressed issues of access identified by children or parents. One intervention described in a 'not sound' evaluation aimed to provide school facilities outside of school hours (Zonderland *et al.*, 1994). This resonates with the suggestion made by children and parents about making school facilities available outside of school hours.

Children and parents wanted more extra-curricular activities to be available from schools. Another UK-based intervention described in a 'not sound' evaluation created formal links between local authority leisure services and schools, in order to provide children with free access to leisure centres and improved information about local facilities (Balding, 2000). A second intervention which has not been soundly evaluated included free transportation for families to physical activities (Baranowski *et al.*, 1990). Two further UK-based interventions in this category aimed to make improvements to school playgrounds (Sahota *et al.*, 2001; Stratton, 2000). This matches a request made by parents for the cleaning up of park spaces and play areas, and represents a promising strategy for further evaluation.

Parents suggested better provision of facilities such as youth clubs for children to meet, especially in bad weather, and for improved cycle paths. No interventions were located to address these ideas. Parents also said that having access to a car and a garden helped their children to take part in physical activity. No interventions were located to help parents achieve access to these resources.

In summary, interventions needing further evaluation were identified that addressed some of the children's identified issues of cost, distance, availability, neglect of facilities, making facilities available, and providing information on activities outside of school. However, no interventions were identified which addressed the barriers posed by busy traffic, the threats of crime or intimidation by older children, or suggestions to provide more cycle paths and youth clubs.

8. DISCUSSION

Outline of Chapter

This chapter considers the implications of the findings of the review for current policy and practice and future research. It ends with a reflection about the methods used to conduct this review and a consideration of their implications for conducting future systematic reviews.

*The chapter will be useful to **all audiences** (practitioners, policy specialists, researchers, children, their parents and friends), particularly section 8.1 which discusses what initiatives have been found to work, through high quality evaluations, in the promotion of physical activity. More specifically:*

- ***Researchers and those involved in developing interventions** to promote physical activity (e.g. practitioners) may be most interested in the discussion of gaps in our current knowledge about barriers and facilitators and of promising new interventions to be developed (section 8.1).*
- ***Researchers** may also be interested in our reflections on the methodology used to conduct the review, the strategies developed for the critical appraisal and data extraction of children's views studies, and the integration of findings from diverse study types (sections 8.4).*
- *For **policy specialists and practitioners** section 8.2 will be the most relevant as it contains an explicit discussion of the findings of the review in terms of current policy and practice. However, section 8.3 should also be of interest to all audiences as it sets out how different readers might work in partnership to build the future evidence-base for promoting children's participation in physical activity.*

8.1 What is known about the barriers to, and facilitators of, physical activity amongst children?

This is the first review of which we are aware which attempts to analyse and synthesise, in a systematic way, the findings from studies of children's views on physical activity; and tries to integrate these findings with those derived from effectiveness studies. Based on the different study types included in this review, we have identified a significant number of barriers to, and facilitators of, physical activity amongst children, and we have also identified areas where current knowledge is limited.

Some of our main findings are that:

- few interventions which try to promote children's participation in physical activity outside the PE lesson have been evaluated in a rigorous way;

- those that have been rigorously evaluated are diverse, in terms both of their findings and the sorts of interventions tested; it is thus difficult to detect clear patterns for factors relating to effectiveness;
- children (and their parents) have clear views on the barriers to, and facilitators of, children's participation in physical activity, yet their views rarely inform the development of interventions; and
- there is little research to guide promoting physical activity amongst socially excluded groups of children.

This section discusses how the findings from each stage of this review - the mapping exercise, the review of outcome evaluations, the studies of children's views and the cross-study synthesis - fit with the findings of the other systematic reviews on the same topic. Four of the previous six systematic reviews we found are effectiveness reviews that contain at least some studies evaluating interventions to promote physical activity amongst children aged 4 to 10 (Fulton *et al.*, 2001; Keays and Allison, 1995; Resnicow and Robinson, 1997; Stone *et al.*, 1998). One review examines the determinants of physical activity in children (Sallis *et al.*, 2000) and another looks at both determinants and effectiveness (Pender, 1998).

Mapping exercise

Results from the mapping stage of this review were similar to results found in the previous series of reviews on healthy eating and physical activity in young people (Rees *et al.*, 2001; Shepherd *et al.*, 2001). We had to screen a large number of citations to maximise our chances of findings as much as possible of all existing relevant research. Most of the 69 studies evaluating interventions we found were conducted in the USA, with only a handful in the UK. Most of the interventions were implemented in primary schools by teachers. Few studies attempt to examine children's own understandings of physical activity.

Outcome evaluations

Like other systematic reviews addressing questions about the effectiveness of interventions to promote physical activity, our task was hampered by two main factors: firstly, the small number of studies judged by reviewers to be capable of providing potentially reliable findings about effectiveness; and, secondly, the heterogeneity of these studies in terms of outcomes measured and types of interventions. In the five soundly evaluated intervention studies we found, the interventions differed on length, number of components, setting, types of activities, and specific behaviour targeted. For example, school-based interventions often included additional components such as family participation activities and newsletters. The outcomes measured differed in terms of whether and/or how physical activity or sedentary behaviours were measured, and the length of time between intervention and outcome measurement. For example, the two interventions aimed primarily at reducing TV use were shorter in duration than the other three interventions, which looked at directly influencing physical activity. Findings on effectiveness also differed across studies and there was no clear pattern to this variation. For example, all five interventions were found to be effective in modifying one or more behavioural or motivational physical activity outcomes for children. However, two studies found positive effects for knowledge but not physical activity,

two studies found positive effects for participation in physical activity but not for reducing TV viewing or video/video-game use, and one study found a positive effect for reduced TV viewing and video/video-game use but not for physical activity. This situation forced reviewers to be very cautious when drawing general conclusions about what works to promote physical activity under what circumstances. As in previous systematic reviews of effectiveness, we were only able to state that a particular intervention had been shown in a particular context to have a positive/negative or no effect on a particular outcome measured in a certain way. However, our review of intervention studies, like other reviews, does raise pertinent questions to answer in the future. For example, the impact of family involvement on both children's and parents' levels of physical activity needs to be more rigorously evaluated. In previous systematic reviews, only the review by Pender (1998) noted the relationship between family involvement and children's physical activity. None of the systematic reviews examining effectiveness addressed the specific need to involve families in promoting children's physical activity.

The interventions evaluated in the outcome studies appear to have been informed by a range of theoretical perspectives. However, it is not possible to tell whether the use of theory leads to more effective interventions or whether interventions developed within one theoretical perspective are better than those developed within another. Multi-component interventions avoid the dangers of taking a purely individualistic 'lifestyle' approach or a purely 'environmental' approach by combining health education with changes to the communities in which children live, and this review has indicated that these can be effective.

These findings complement the results of the other systematic reviews, which found that multi-component school-based interventions affected behaviour. It is reasonable to suggest that most interventions be provided in a school setting, since this is where children spend a great deal of their time. However, it is important to achieve greater clarity about the extent to which additional components, such as parental involvement or the provision of community activities, may influence children's physical activity.

Studies examining children's views

Children provide valuable data on the factors that help them to be physically active or prevent this. Our synthesis of findings across studies revealed a wide range of barriers and facilitators identified by children or parents. The total of 35 distinct, but interrelated, factors covered children's personal preferences, priorities and valued aspects of physical activity; the role of family life and parental support; and the importance of safe access to opportunities for physical activity. Some barriers and facilitators were more pertinent for particular groups of children (for example, the cost of taking part in sports was particularly described by children from lower-income families), or for particular types of physical activity (for example, a lack of enjoyment of physical activity was a reason for not taking part in 'sports' or 'exercise' rather than more unstructured forms of physical activity). Given that gender appears to play a role in declining levels of physical activity as children get older (levels decline more sharply in girls), it was surprising that few differences in views according to gender were identified (or examined) by our included studies. This should be examined in future studies.

Restricted opportunities for physical activity identified by children and their parents (e.g. cost, burden of organising safe travel to facilities, traffic, threat of crime and intimidation by older children) relate to increasing attention to risk in children's lives (Harden *et al.*, 2000b) and the concern that children have 'lost their freedom to play and roam around, to be just 'children'; that they are 'battery reared' rather than 'free range' (O'Brien *et al.*, 2000). Some of the facilitators to physical activity indicate that families with more money and spare time (to provide garden play at home, travel by car to facilities elsewhere) are better able to overcome structural barriers. Suggestions for cleaning up park spaces and play areas, providing better cycle paths, and making school facilities more accessible out of school lessons resonate with research about child-sensitive urban-regeneration which found that children have many useful ideas for neighbourhood renewal and that more play space and city maintenance were priorities (O'Brien *et al.*, 2000).

The studies of children's (or parents') views did not allow for any assessment of the relative importance of different barriers or facilitators. Rather, the strength of combining the findings across studies lay in obtaining a more comprehensive picture of the range of relevant factors than that which could be obtained from any one study alone. In this sense, each study can be seen as contributing to a larger 'patchwork' of knowledge about barriers and facilitators derived from children's own perspectives.

Our approach to reviewing studies, which included looking specifically for children's views about the factors influencing their physical activity, differs from the methods used in previous reviews of the correlates and determinants of physical activity in children (Pender, 1998; Sallis *et al.*, 2000). While these reviews may have identified common factors, ours elicited specific detail about that factor as described by children. For example, parental influence emerged as an important factor in all three reviews, but we explored what that meant to children in terms of specific barriers and facilitators. Other common findings across the three reviews were time constraints; personal preferences; and access as important influences on children's physical activity.

Integrating the findings of children's views with findings on intervention effects

The cross-study synthesis showed that very few soundly evaluated interventions resonated clearly with children's views. This was most noticeable in relation to issues of access identified by children (busy traffic, poor quality of playgrounds, and the need for easily accessible local facilities). The scarcity of high quality intervention research means that the scope for making recommendations for practice and policy is limited. However, several promising studies requiring further evaluation are referred to in section 8.3.

8.2 What are the implications for current policy and practice?

A main finding of this review is the limited reliable evidence on the effectiveness of interventions to promote physical activity among children. As most evaluations also

come from the USA, questions arise about whether effective interventions will be transferable to the UK context. A key part of policy and practice surrounding promoting children's participation in physical activity in the UK in the future will therefore be creating opportunities for promising interventions to be rigorously evaluated as part of a co-ordinated research programme. This is discussed in more detail in section 8.3.

The dearth of reliable studies means that the findings of this review are largely disappointing in terms of providing evidence that current policy initiatives will be effective. For example, none of our intervention studies demonstrated in a reliable way the effectiveness of providing increased opportunities for active recreation such as those being initiated in the Sport Action Zones (e.g. providing after-school clubs). Similarly none of the interventions identified had evaluated the effectiveness of schemes to encourage active travel to school. Active transport to school is currently being encouraged by the DfES, the DTLR and the DoH, which have produced guidance for local authorities, schools and parents on building a safe environment for pupils to walk or cycle to school. A paucity of evidence on the benefits of active transport has also been highlighted by a systematic review commissioned by the Department of the Environment, Transport and the Regions of the impact on children's social and cognitive functioning of mode of travel to school (Gough *et al.*, 2001).

Promoting physical activity in school settings can lead to positive effects, although it is not clear whether these observed effects translate into long-term participation in physical activity.

The finding that children would like to have more access to facilities is highly relevant to current DCMS initiatives, which include refurbishing school sports facilities and opening these up to the wider community. Such a move would be in line with children's views.

Children and parents identified issues to do with access to structured physical activities, such as cost, transport and availability. Measures to reduce or remove cost and improve transport could be implemented through partnerships between schools, Local Education Authorities and other local services. Children also identified barriers to accessing park spaces and streets due to threats of crime, threats of intimidation by older children, busy traffic and poor park conditions. Two interventions evaluated the impact of making improvements to school playgrounds. These initiatives resonate with guidance provided by the DoH, the DfES, and the DTLR for local authorities to build safe environments for pupils to walk or cycle to school. They are also prime candidates for joint consideration by Health Action and Sport Action Zones.

Such approaches, like most of the potential initiatives discussed in this report, call ideally for efficient funding partnerships between the DfES, DoH, DTLR and DCMS. Promoting children's health through physical activity is a prime example of a cross-sectoral policy issue. Joined-up planning and research commissioning could prompt both short- and long-term benefits across a wide range of areas. Evaluations involving random allocation to intervention and control schools could be set up under such joint funding, for example from the DoH and DTLR. Random allocation should not be considered unethical or unfeasible by any partner as it is likely that under conditions of uncertain effectiveness funds for such schemes would not be available

to all schools within one Local Education Authority. In this situation, random allocation is an ethical way of distributing finite resources with the added benefit of a rigorous evaluation (Toroyan *et al.*, 2002).

A further key message for policy and practice from the findings of this review is always to involve children and their parents in the development and evaluation of any initiative aiming to promote children's physical activity.

8.3 Building the evidence base: lessons for the future

The unanswered questions identified in this review should be a starting point for building the future evidence base for promoting physical activity amongst children. The preceding sections highlight the need to improve the way research is carried out and reported, and the strategy of services working in partnership with one another and with researchers to build the evidence base. The lack of UK studies makes conducting more relevant and rigorous research in the UK a particularly urgent task. This section explores how this could be achieved.

Evaluating effectiveness

The design of a controlled trial appears to be popular for evaluating interventions to promote physical activity amongst children. In our map we found that nearly three-quarters of the 69 intervention evaluations we located were trials, and half of these were randomised controlled trials. This finding joins others in contradicting a belief, widely held belief in the health promotion evaluation methods literature (see e.g. Davies and Macdonald, 1998), that health promotion trials are difficult to conduct or are inappropriate to the goals of health promotion.

The strength of a trial lies in its establishment of two or more groups which are similar to each other in as many respects as possible apart from the intervention under evaluation. Evidence in the field of healthcare suggests that randomly generated comparison groups are superior to non-randomly generated groups in this respect (Kleijnen *et al.*, 1997; Kunz and Oxman, 1998). Similar findings have begun to emerge in education and health promotion (e.g. Peersman *et al.*, 1999b; Shadish and Ragsdale, 1996). In health promotion, evidence is accumulating that evaluations which do not use a control or comparison group, compared to those which do, are more likely to conclude that an intervention has positive effects (Oakley, 2000b; Oakley and Fullerton, 1996). Evaluations of initiatives using such designs are likely to mislead policy-makers into false conclusions about the most effective ways to promote public health.

When we looked in-depth at evaluations of interventions to promote children's participation in physical activity, we only considered those evaluations which used a trial design. However, while taking this methodological approach is desirable, it is not sufficient to guarantee the generation of valid findings. When we assessed the methodological quality of outcome evaluations designed as trials in more detail, we found many common, but significant, threats to the validity of their findings. In particular, the employment of non-equivalent groups or the failure to report baseline equivalence of groups on outcome and socio-demographic variables was a problem for a significant number of the evaluations. These shortcomings are familiar; they

have been found in many other systematic reviews within health promotion (Oakley *et al.*, 1996a; Peersman *et al.*, 1998; Peersman *et al.*, 1996; Tilford *et al.*, 1997; White and Pitts, 1997). They clearly highlight the need for improvement in trial execution and reporting. Trial reporting would be improved by more use of standardized formats, such as that provided in the CONSORT statement (Moher *et al.*, 2001). Better execution of trials will be facilitated by the small, but growing, literature documenting methodological advances in conducting RCTs of social interventions (e.g. Oakley, 2000a; Stephenson *et al.*, 2003; Strange *et al.*, 2001). The establishment of several UK and international initiatives focusing on systematically reviewing the effectiveness of social interventions in fields such as education, criminology and social policy should also stimulate methodological innovation and capacity-building in this area (e.g. Davies and Boruch, 2001; Oakley and Gough, 2000; Oliver and Peersman, 2001).

There are particular debates about the role of RCTs in evaluating interventions to address structural factors. In the area of children's physical activity, examples are cleaning up parks and playgrounds, creating more cycle paths, reducing busy traffic and developing initiatives to tackle crime and the threat of crime. Few evaluations of these types of interventions were identified in our review. Some researchers argue that RCTs may not be feasible in such circumstances and that we ought instead to make the best use of rigorous before-and-after assessments of 'naturally occurring experiments' (Nutbeam, 2001). However, Macintyre (2001) suggests that this may reflect a 'defeatist' attitude to well-designed experimental evaluation, and argues that researchers could use their creativity to resolve some of the difficulties met in assessing the impact of efforts to tackle the wider determinants of social and health problems. Of course, carrying out well-designed RCTs also requires a commitment from funders to provide adequate resources.

It is often assumed that trials are 'quantitative' studies and that they can only collect this type of data. However, there is a growing consensus that trials should also collect 'qualitative' data to evaluate the processes involved in intervention implementation (e.g. Cook and Reichardt, 1979; Oliver and Peersman, 2001). Our mapping exercise indicated that a small number of outcome evaluations are beginning to follow this recommendation (around a quarter of these conducted integral process evaluations). Process evaluations attached to rigorous outcome evaluations can provide valuable information on an intervention's acceptability, relevance and quality of implementation, and can therefore help to answer questions about the generalisability of findings to other cultures and population groups.

Improving the quality of evaluation methods requires an appropriate infrastructure which provides opportunities for practitioners, policy-makers, researchers and the public to collaborate. Also necessary is an expansion of the research capacity and the skills of social and public health scientists in evaluation techniques; and adequate sources of funding which allow for long-term follow-up and samples large enough to detect intervention effects.

Research with children

The findings of our review are disappointing with respect to the key methodological and ethical issues of conducting research with children. Studies which describe factors influencing children's participation in physical activity promotion can make a

valuable contribution to developing relevant and appropriate interventions. Those which attempt to understand physical activity from children's own perspectives are particularly important, as these provide an important contrast to 'expert-driven' research evaluating interventions developed on the basis of what adults think is important. As the findings of this review have demonstrated, comparing children's (and their parents') views with 'expert-driven' research raises important issues for policy, practice and research.

We found only a small number of relevant studies exploring children's views about barriers and facilitators relating to their participation in physical activity. Children's everyday lives have not yet been studied in sufficient detail to build up an accurate picture of the range of activities (physically active or otherwise) that children engage in. The studies we identified for this review tended to focus down on issues like their beliefs or attitudes to exercise or sport, rather than starting more broadly from children's everyday lives to see where physical activity might fit in. Most of the studies were conducted in schools, and they failed to give much information about the characteristics of the children involved in the research, or about the methods used to collect, analyse and interpret data. The methods used (or the lack of detail presented on the methods) did not encourage a great deal of confidence that study findings really were rooted in children's own perspectives. Most studies employed methods that allowed children to respond in their own words in interviews, focus groups or in response to a draw and write task. However, the researchers' facilitation skills and rapport with the children may be more important in encouraging them to express their views (Harden *et al.*, 2000a) and these skills were not reported in the studies we reviewed. But methods of analysis were either inappropriate (for example, children's views were coded according to frameworks derived from research with adults), or were not reported in sufficient detail.

Only one study actively involved children in its design or conduct. There was sometimes an uncomfortable elision between parents' and children's views, with parents implicitly regarded as reliable proxy informants. Consent was handled badly. It was often unclear as to what children had been told about the research, and their active consent to participate was not sought. These shortcomings are particularly surprising in the light of the arguments commonly put about the superiority of 'qualitative' over 'quantitative' research in privileging the subjectivity of research participants (Morse, 1994). They repeat themes identified by others about the treatment of children in research as a marginal group incapable of providing valid and reliable data (Mayall, 2002). There is currently much interest in developing better methods for researching children's perspectives (e.g. Christensen and James, 2000; Roberts, 2000). Roberts (2000) discusses how it is not sufficient simply to listen to young people; it is also important to hear and act on their views.

The role of children in the intervention studies examined in this review was similarly marred by researchers' reluctance to see children's perspectives as a valued and valuable resource. Interventions were commonly developed without seeking input from children about strategies they see as appropriate and potentially effective, and they then went on to be tested in ways which ignore the role children can play in developing research tools and outcome measures. Children represent an enormous untapped resource in terms of developing the evidence-base for health promotion initiatives designed to improve their health, and this represents a real challenge for future work in this area.

8.4 Methodological issues in conducting this systematic review

This review builds on an earlier series of systematic reviews conducted by the EPPI-Centre on the barriers to, and facilitators of, mental health, physical activity and healthy eating among young people. The current review provided an opportunity to develop further the framework developed in the earlier series. This framework facilitates the inclusion of both 'quantitative' and 'qualitative' studies within a systematic review, a move which is increasingly highlighted as important (Dixon-Woods *et al.*, 2001). Although there is an emergent literature on synthesising the 'qualitative' findings from ethnographic studies (e.g. Noblitt and Hare, 1998; Patterson *et al.*, 2001), the development of formal methods for bringing together these different types of studies in a review has received very little attention. The methodological work that has taken place as part of this review therefore goes some way towards remedying this situation.

The framework developed in our earlier review series was applicable to examining the barriers to, and facilitators of, physical activity among children. Most of the refinements we made to the framework relate to the detailed processes involved in moving from extracting details on the methods and findings of studies, through to 'reconstructing' each study in a standardised format in order to make comparisons across studies and produce a synthesis of findings. We have been able to make significant advances in understanding how two reviewers work back and forward through these stages in attempting to identify sets of barriers and facilitators in the included literature. These advances will hopefully contribute to a clearer description of the stages involved in our framework and will help others to use it.

A more substantive refinement concerned our quality assessment procedures for studies of children's views. Because the studies included in the review focused on children rather than young people (and sometimes included parents as 'proxy' respondents), we were challenged to think about the quality of studies in new ways. We tested a new set of 'quality criteria' which went beyond quality of reporting issues to assess whether studies used appropriate data collection methods to help children express their views and appropriate analysis methods to ensure that children's views were represented, and whether children were actively involved in the design and/or conduct of the study. Taken together, these criteria enabled reviewers to make judgements about the confidence they could attach to study findings being rooted in children's own perspectives.

There were also methodological issues in reviewing the effectiveness studies or 'outcome evaluations'. The procedures followed in this review for extracting data and quality assessing these studies differ from those we have used before. Previously, all studies passing inclusion criteria had complete data extraction undertaken, with quality assessment as one component. Studies were not deemed to be 'sound' or 'not sound' until all data had been extracted. In the current review, we chose to do the quality assessment first and then only extract complete data for those studies deemed 'sound'. While this provided a workable method for reliably examining a large number of studies in a short time period, it did not allow us to elicit findings related to important processes of the studies, such as the extent of children's and parents' involvement in intervention development. Doing a limited data extraction on

studies deemed 'not sound' as a way of capturing this information is perhaps a good compromise to be explored in future reviews.

An interesting issue arose when we quality assessed outcome evaluations. Four studies met our criteria for 'soundness' (i.e. they reported complete pre- and post-test data for all groups, equivalence of groups at baseline, and data on all outcomes). However, one study was judged to be 'sound despite discrepancies'. It did not report pre-intervention data for all individuals, but was given further consideration because the authors had conducted an intention-to-treat analysis, meaning that all those present at baseline were represented in the analysis. The criterion of the reporting of pre-intervention data attempts to appraise the potential for selection bias in a study. The use of an intention-to-treat approach combined with random allocation was considered sufficient protection against selection bias. As a result, we are currently testing a new set of criteria for assessing the methodological quality of intervention studies.

All the methodological developments outlined in brief here will be explored in more detail in separate publications.

9. CONCLUSIONS AND RECOMMENDATIONS

Outline of Chapter

This chapter draws conclusions from the findings of all stages of the review and makes recommendations for policy, practice and further research. It lists interventions that have been shown to be effective in methodologically robust studies and those interventions which appear to be acceptable to children but need further rigorous evaluation; suggests ways in which children and parents can be involved in developing and evaluating interventions; and makes recommendations for conducting and reporting research.

*The chapter will be useful to **all audiences** (practitioners, policy specialists, researchers, children, their families and friends). More specifically:*

- ***Policy specialists** may particularly like to consider the effective interventions listed in section 9.1. They may also be interested in encouraging practitioners and researchers to take up the recommendations for future development and evaluation of interventions (section 9.2), involving children and parents in this work (section 9.3), and conducting and reporting research (section 9.4).*
- ***Practitioners** may be particularly interested to read about the effective interventions (section 9.1), and the recommendations for future development and evaluation of interventions (section 9.2) and involving children and parents in such initiatives (section 9.3).*
- ***Researchers** will find information relevant to their work about future development and evaluation of interventions (section 9.2), involving children and parents in research (section 9.3), and conducting and reporting research (section 9.4).*
- ***Children and their families** might be most interested in section 9.3 which supports the case for actively involving children and parents in services and research.*

The aim of the review described in this report was to survey what is known about the barriers to, and facilitators of, physical activity participation amongst children. This was done with the goal of drawing out the implications for policy. The review has mapped and quality screened the research in this area, and brought together the findings from evaluations of interventions aiming to promote physical activity and studies which have elicited children's or their parents' views.

The first major finding is that, whilst there has been a significant amount of research activity in this area, there is insufficient good quality research evaluating the effectiveness of interventions, particularly in the UK. This is in line with the conclusions of most recent systematic reviews of health promotion effectiveness, including a recent systematic review of interventions for preventing and treating childhood obesity (NHS Centre for Reviews and Dissemination, 2002). We found even fewer rigorous evaluations of the kinds of interventions that were the focus of our in-depth review – those that aimed to promote children's physical activity beyond the PE lesson. The review only identified five rigorous outcome evaluations, two of which showed that interventions could be effective for increasing physical activity

amongst some groups of children. A further two studies showed an effect for knowledge and one study reduced TV and video use and the number of meals eaten in front of the television. The key components of effective interventions therefore remain unclear. There is particular uncertainty about the importance of family involvement, which was a component in some of these interventions, and was identified as a promising approach in the CRD review of interventions for childhood obesity (NHS Centre for Reviews and Dissemination, 2002). There is also lack of clarity about long-term benefits and the generalisability of conclusions about effectiveness.

Secondly, it is evident that children have clear views on the barriers to, and facilitators of, their participation in physical activity. When considered in conjunction with findings about the effectiveness of interventions, such views highlight a number of promising directions for the future development and testing of physical activity interventions. Currently, interventions evaluated by good quality research do not always target what children (and parents) see as the main barriers to physical activity, and they do not always build on what children (and parents) see as the main facilitators. Most of the barriers to, and facilitators of, children's physical activity related to the 'here and now': the enjoyment (or lack of enjoyment) to be had and the practical difficulties of participating. There is very little focus on the motivation of good adult health. Insofar as the rationale for public policy in this area is an adult agenda with a long time frame, there is unlikely to be much progress in promoting children's physical activity until their day-to-day perspectives are taken into account.

A third, related, issue is the paucity of research addressing structural or environmental features of children's lives affecting their ability to be physically active. Concerns about the lack of appropriate spaces in which children can safely engage in either organised or informal physical activities are not matched by research testing the effectiveness of approaches to increasing these as a necessary resource. While most of these concerns are about the wider community, there are also issues about space for physical activity *inside* schools. For example, since 1982, when education authorities were given the right to sell off playing fields, an estimated 6000 sites have been sold to make way for car parks, housing developments or supermarkets; some inner city children now lack access to any grass pitches at all (Kelso, 2002). More research on structural barriers to children's physical activity might help to highlight the negative impact of such policy developments.

A fourth major finding is that there appears to be little current research about the promotion of physical activity for socially excluded groups of children. This apparent lack of research on socially excluded groups is significant, since current health policy in the UK has a clear commitment to tackling the wider determinants of health and inequalities in health.

Whilst the evidence base is limited, a number of specific conclusions and recommendations for current policy and practice and the future development of interventions to promote physical activity amongst children can be made. It is also possible to suggest improvements in evaluation studies in this area, and ways of involving children in research.

9.1 Recommendations for promoting physical activity amongst children

This set of recommendations is based on the review's findings from the five interventions whose impact has been assessed in well-designed outcome evaluations. Because the pool of studies is small, clear patterns were difficult to identify and results from individual studies may not be generalisable. In particular, caution is needed when transferring findings from US studies to the UK. Nevertheless, the following interventions have been demonstrated to have some positive effects:

- **Strategies to reduce sedentary behaviours involving child and/or parental education in school or primary care settings and provision of equipment for monitoring home TV, video and video-game use can be effective for improving physical activity levels and reducing sedentary behaviours.** Two interventions to limit TV and video use were found to be effective for increasing participation in organised physical activity (Ford *et al.*, 2002) and reducing TV and video-related sedentary behaviour (Robinson, 1999).
- **Involving parents in interventions appears to be effective in increasing children's participation in physical activity and/or their knowledge about physical activity. However, whether parental involvement is critical to the success of intervention has not yet been explicitly tested.** Four studies with a component of parental involvement were effective in either increasing children's physical activity (Ford *et al.*, 2002; Luepker *et al.*, 1996), or improving children's knowledge (Gortmaker *et al.*, 1999; Walter *et al.*, 1988).
- **Multi-component healthy eating and physical activity interventions can be effective for improving the time children spend in physical activity.** One intervention combining school-based food changes, health curricula modifications and PE lessons with home-based parental activities increased the reported time children spent in vigorous physical activity (Luepker *et al.*, 1996).

9.2 Recommendations for the future development and evaluation of interventions to promote physical activity amongst children

This set of recommendations is based on interventions included in this review which look 'promising' because they have been identified as matching children's views about the main barriers to, and facilitators of, their physical activity, but they have not yet been evaluated in a rigorous way. These interventions need to be developed and evaluated further. In addition, when children identified barriers or facilitators which have not yet been targeted by evaluated interventions, recommendations can be made for interventions to be newly developed and evaluated.

In terms of children's **preferences, priorities and valued aspects** of physical activity, the following kinds of interventions could be further developed and evaluated:

- **Interventions which provide opportunities for children to participate in brief, simplified activities in school break-times.** Children reported problems with the complex rules involved in some activities, and boredom.
- **Interventions encouraging children to select their own fitness activities as part of a personalised fitness module.** Children expressed a desire to choose their own physical activities
- **Interventions which build upon the social aspects of participating in physical activity.** Children described enjoying the social benefits of taking part in physical activities with their friends.
- **Interventions that offer a range of physical activities based on children's own preferences.** Children reported a wide range of preferred structured physical activities.
- **Interventions that build on the physical and mental health aspects of physical activity valued by children.** Children were enthusiastic about physical activity as a way of keeping fit and healthy, controlling weight, and relaxing and forgetting their troubles.
- **Interventions that help children deal with peer ridicule and that enable children to encourage their peers' sporting performance.** Children made it clear that negative peer comments could deter them from taking part in sport. In addition, they described the beneficial aspects of having a sense of belonging and of positive peer response after they performed well in sports.
- **Interventions which aim to promote acceptance among children of diverse shapes and types of bodies.** Children identified concerns about their own physiques, skill levels and senses of belonging.

In terms of **family life and parental support**, the kinds of interventions that could be considered for development and evaluation include:

- **Interventions encouraging family participation in a social environment.** Children reported that they enjoyed taking part in physical activity with their parents.
- **Interventions to overcome problems for parents in organising safe means of low-cost or free transport to sport and exercise facilities.** Children and their parents noted that their parents' ability to transport them to activities could influence their participation.
- **Interventions to promote and reinforce family support for physical activity.** Children said that supportive and encouraging families helped them to take part in physical activity.
- **Interventions using multi-component strategies to involve parents in promoting their children's physical activity in part by increasing their own physical activity levels.** The importance of parental enthusiasm and parents' own participation in sports, exercise and other forms of physical activity was identified as an influential factor.

In terms of issues of children's **access** to physical activity, relevant interventions for future research include:

- **Interventions that open up school facilities for use after school hours.** Children identified a lack of availability of local facilities for physical activity and requested that schools provide more extra-curricular opportunities.
- **Interventions that improve facilities for unstructured play and structured activities in children's local environments.** Children and parents identified the poor condition of playgrounds and parks as a barrier, and requested that park spaces and play areas be cleaned up.
- **Cross-sector interventions creating formal links (for example, between local authority leisure services and schools) in order to provide children with free access to, and more information about, leisure centres.** The cost of structured activities and the lack of information about local organised sports were identified as barriers to participation.
- **Interventions to help parents organise transport to physical activities or manage the cost of structured physical activities.** Parents and children both identified the negative impact of the cost of activities and the availability of transport to activities.
- **Interventions to address the environmental barrier posed by busy traffic.** Children said that busy traffic limited their unstructured physical activity.
- **Interventions that create safer environments in which children can play.** Children and parents described the threat of crime and intimidation by other children as influencing children's participation in unstructured physical activity.
- **Interventions providing more cycle paths for family use.** Children identified cycling as a preferred activity, and noted that busy traffic was a barrier. Parents suggested the provision of more cycle paths to encourage their children to be active.
- **Interventions to create youth clubs for children.** Parents requested the provision of youth clubs where their children could be active in a safe environment.

9.3 Recommendations for involving children and parents in the development of interventions

This set of recommendations gives guidance as to how practitioners and researchers can work in partnership with children and parents to develop appropriate and effective interventions to promote children's physical activity.

- **Children's views should be the starting point for any future development of efforts to promote physical activity.** Children talked about three main sets of

themes relating to their participation in physical activity: preferences, priorities and valued aspects; family life and parental support; and issues of access.

- **Children should be consulted on matters concerning the promotion of their physical activity.** This is not only an ethical imperative but also critical in developing effective and acceptable interventions. Most of the (otherwise sound) current intervention research has not consulted children or their parents about intervention development or evaluation. Where possible, children should be asked directly for their views on what could or should be done to promote their participation in physical activity.
- **The views of socially excluded groups such as children from low incomes families, from minority ethnic groups or with disabilities need to be sought.** No studies focused exclusively on these aspects of inequality. The influence of gender also needs to be examined.
- **Children, parents and other stakeholders should be involved in planning the evaluation of interventions to promote physical activity.** Their views will be valuable in determining relevant and appropriate data collection methods, tools and topics, and in determining outcomes to be measured.

9.4 Recommendations for conducting and reporting evaluations of interventions and research on children's and parents' views

- **When possible, outcome evaluations should be designed as randomised controlled trials using individuals, families, schools, geographical areas or Local Education Authorities as units of allocation.** Although there may be circumstances in which this might not be possible, there are currently many missed opportunities for employing this design to evaluate effectiveness. Researchers need to work with teachers, health promotion practitioners and education officials to identify opportunities for setting up such evaluations. Policy-makers and research commissioners need to allocate sufficient funds to support such work.
- **Outcome evaluations should include integral process evaluations.** Well-conducted process evaluations can offer valuable insights into the reasons for the success (or otherwise) of interventions, and can elicit the views of those involved in delivering or receiving the intervention and monitor the contextual variables impacting on its implementation.
- **Key aspects of the methodology and results of outcome evaluations need to be reported in a detailed and consistent manner to promote confidence in their rigour.** The outcome evaluations reviewed in this report did not consistently describe pre-test and post-test data of all participants; establish the equivalence of intervention and control groups; or report the impact of the intervention for all outcomes targeted. These are minimum benchmarks of quality. As complete information as possible should also be provided on the aims of the study; on the method of randomisation where used; on numbers of

participants assigned to intervention and control groups; on attrition rates; and on the design, content and delivery of the intervention.

- **Studies examining children's views need to engage children in a way that respects them as research participants.** This can be accomplished by: ensuring that consent is obtained from parents **and** children; developing methods of data collection which minimise power differences between researchers and children; using data collection methods that allow children to feel comfortable about expressing their opinions; ensuring that appropriate methods are used to ground the data analysis in children's own perspectives; and actively involving children in the design and conduct of studies.
- **The reporting of studies of children's views and process evaluations needs to be more complete, as basic data are often missing.** Detailed descriptions of the selection, recruitment and characteristics of the sample and the methods used to collect and analyse data should always be presented. It is desirable that some attempts are made (and reported) to ensure the reliability and validity of the data collection and data analysis methods. An outline of how the study's findings contribute to the existing knowledge-base is always helpful.

Many of the above suggestions do, of course, apply to health promotion research and research evaluating social interventions much more generally. The specific points about research with children can be extended to other areas of research involving children, and apply also to many areas of research where data are collected from other social minority groups.

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APPENDIX A: Search strategies

MEDLINE

- 1 exp child/
- 2 exp adolescence/ or exp child, hospitalized/ or exp child institutionalized/ or exp disabled children/ or infant/
- 3 1 not 2
- 4 exp child preschool/
- 5 exp students/
- 6 ((university or college or medical or graduate or post graduate) adj2 student\$).ti,ab.
- 7 5 not 6
- 8 (school adj3 (child\$ or pupil\$ or student\$ or kid or kids or primary or nursery or infant\$)).ti,ab.
- 9 or/3-4,7-8
- 10 exp health promotion/
- 11 exp health education/
- 12 exp preventive medicine/
- 13 (prevent\$ or reduc\$ or promot\$ or increas\$ or program\$ or curricul\$ or educat\$ or project\$ or campaign\$ or impact\$ or risk\$ or vulnerab\$ or resilien\$ or factor\$ or correlate\$ or predict\$ or determin\$ or behavior#r\$).ti,ab.
- 14 (health\$ or ill or illness or ills or well or wellbeing or wellness or poorly or unwell or sick\$ or disease\$).ti,ab.
- 15 ((prevent\$ or reduc\$ or promot\$ or increas\$ or program\$ or curricul\$ or educat\$ or project\$ or campaign\$ or impact\$ or risk\$ or vulnerab\$ or resilien\$ or factor\$ or correlate\$ or predict\$ or determin\$ or behavior#r\$) adj3 (health\$ or ill or illness or ills or well or wellbeing or wellness or poorly or unwell or sick\$ or disease\$)).ti,ab.
- 16 or/10-12,15
- 17 (determin\$ or facilitat\$ or barrier\$).ti.
- 18 Risk factors/
- 19 Culture/
- 20 Family/ or Internal-external control/ or Life style/ or Prejudice/ or Psychology, social/ or Psychosocial deprivation/
- 21 child behavior/
- 22 habits/
- 23 poverty/
- 24 social class/
- 25 social conditions/
- 26 socioeconomic factors/
- 27 Family characteristics/
- 28 ethnicity.ti,ab.
- 29 Attitude to health/
- 30 or/17-29
- 31 exp sports/
- 32 exp physical fitness/
- 33 exp exertion/
- 34 "Physical education and training"/
- 35 exp Leisure activities/

- 36 Recreation/
- 37 ((sedentary or inactiv\$) adj3 child\$.ti,ab.
- 38 ((physical\$ or sport\$ or exercis\$ or game\$1) adj3 (activit\$ or exercis\$ or exert\$ or fit or fitness or game\$1 or endurance or endure\$1 or inactiv\$ or educat\$ or train\$1 or training)).ti,ab.
- 39 or/31-38
- 40 or/16,30
- 41 and/9,39-40
- 42 limit 41 to english language
- 43 limit 42 to yr=1981-2001

EMBASE

- 1 exp child/
- 2 Brain damaged child/ or Gifted child/ or Infant/
- 3 1 not 2
- 4 exp school/
- 5 College/ or Medical school/ or University/
- 6 4 not 5
- 7 Child health/
- 8 School health service/
- 9 (school adj3 (child\$ or pupil\$ or student\$ or kid or kids or primary or nursery or infant or elementary)).ti,ab.
- 10 or/3,6-9
- 11 exp health education/
- 12 patient education/
- 13 11 not 12
- 14 primary prevention/
- 15 preventive medicine/
- 16 (prevent\$ or reduc\$ or promot\$ or increas\$ or program\$ or curricul\$ or educat\$ or project\$ or campaign\$ or impact\$ or risk\$ or vulnerab\$ or resilien\$ or factor\$ or correlate\$ or predict\$ or determin\$ or behavio\$).ti,ab.
- 17 (health\$ or ill or illness or ills or well or wellness or wellbeing or poorly or unwell or sick\$ or disease\$).ti,ab.
- 18 ((prevent\$ or reduc\$ or promot\$ or increas\$ or program\$ or curricul\$ or educat\$ or project\$ or campaign\$ or impact\$ or risk\$ or vulnerab\$ or resilien\$ or factor\$ or correlate\$ or predict\$ or determin\$ or behavio\$) adj3 (health\$ or ill or illness or ills or well or wellness or wellbeing or poorly or unwell or sick\$ or disease\$)).ti,ab.
- 19 or/13-15,18
- 20 Behavior modification/
- 21 Cardiovascular risk/ or Risk/ or Risk factor/
- 22 Lifestyle/ or "Lifestyle and related phenomena"/
- 23 Cultural deprivation/ or Homelessness/ or Social problem/ or Unemployment/
- 24 Cultural factor/ or Ethnic difference/ or "Ethnic or racial aspects"/ or Race/ or race difference/
- 25 Social psychology/
- 26 exp self concept/
- 27 child behavior/
- 28 Habit/
- 29 exp social status/
- 30 Social structure/ or Socioeconomics/
- 31 Family life/

32 Attitude/
 33 (social\$ adj3 (depriv\$ or exclusion or exclude\$ or disadvantage\$)).ti,ab.
 34 (facilitat\$ or barrier\$ or determin\$).ti.
 35 or/20-34
 36 19 or 35
 37 Sport/
 38 exp exercise/
 39 exp physical activity/
 40 Endurance/ or Physical capacity/ or Physical performance/ or Training/
 41 Exercise tolerance/ or Physical tolerance/
 42 Leisure/ or Recreation/
 43 Physical education/
 44 ((physical\$ or sport\$ or exercis\$ or game or games) adj3 (activit\$ or exercis\$ or exert\$ or fit or fitness or game or games or endurance or endure\$ or child\$ or inactiv\$ or educat\$ or train\$)).ti,ab.
 45 sedentary.ti.
 46 or/37-45
 47 and/10,36,46

CINAHL

1 "Child"/ all topical subheadings / all age subheadings
 2 "Child,-Preschool"/ all topical subheadings / all age subheadings
 3 "Child-Health"/ all topical subheadings / all age subheadings
 4 "School-Health"/ all topical subheadings / all age subheadings
 5 "School-Health-Education"/ all topical subheadings / all age subheadings
 6 "Students,-Middle-School"/ all topical subheadings / all age subheadings
 7 (school* near3 (child* or pupil* or student* or kid or kids or primary or nursery or infant*)) in TI,AB
 8 #1 or #2 or #3 or #4 or #5 or #6 or #7
 9 "Health-Promotion"/ all topical subheadings / all age subheadings
 10 explode "Health-Education" tree: 3/ all topical subheadings / all age subheadings
 11 "Preventive-Trials"/ all topical subheadings / all age subheadings
 12 "Preventive-Health-Care"/ all topical subheadings / all age subheadings
 13 (prevent* or reduc* or promot* or increas* or program* or curricul* or educat* or project* or campaign* or impact* or risk* or vulnerab* or resilien* or factor* or correlate* or predict* or determin* or behavio*) in ti, ab
 14 (health* or ill or illness or ills or well or wellbeing or wellness or poorly or unwell or sick* or disease*)in ti,ab
 15 #13 near3 #14
 16 #9 or #10 or #11 or #12 or #15
 17 (determin* or facilitat* or barrier*) in ti
 18 "Risk-Factors"/ all topical subheadings / all age subheadings
 19 "Cardiovascular-Risk-Factors"/ all topical subheadings / all age subheadings
 20 "Coronary-Prone-Behavior"/ all topical subheadings / all age subheadings
 21 "Culture"/ all topical subheadings / all age subheadings
 22 "Attitude"/ all topical subheadings / all age subheadings
 23 "Attitude-to-Life"/ all topical subheadings / all age subheadings
 24 "Consumer-Attitudes"/ all topical subheadings / all age subheadings
 25 "Cultural-Bias"/ all topical subheadings / all age subheadings
 explode "Family-Attitudes"/ all topical subheadings / all age subheadings

- 26 "Gender-Bias"/ all topical subheadings / all age subheadings
 27 "Social-Attitudes"/ all topical subheadings / all age subheadings
 28 #22 or #23 or #24 or #25 or #26 or #27 or #28
 29 "Child-Behavior"/ all topical subheadings / all age subheadings
 30 "Habits"/ all topical subheadings / all age subheadings
 31 explode "Poverty"/ all topical subheadings / all age subheadings
 32 "Social-Class"/ all topical subheadings / all age subheadings
 33 "Social-Problems"/ all topical subheadings / all age subheadings
 34 explode "Discrimination"/ all topical subheadings / all age subheadings
 35 "Juvenile-Delinquency"/ all topical subheadings / all age subheadings
 36 "Latchkey-Children"/ all topical subheadings / all age subheadings
 37 #34 or #35 or #36 or #37
 38 "Socioeconomic-Factors"/ all topical subheadings / all age subheadings
 39 explode "Family-Characteristics"/ all topical subheadings / all age subheadings
 40 "Attitude-to-Health"/ all topical subheadings / all age subheadings
 41 (social* near3 (depriv* or exclude* or exclusion)) in ti, ab
 42 "Students-Elementary"
 43 "Schools-Elementary;"
 44 #17 or #18 or #19 or #20 or #20 or #21 or #29 or #30 or #31 or #32 or #33 or #38 or #39 or #40 or #41 or #42
 45 #8 or #43 or #44
 46 #45 or #16
 47 explode "Sports"/ all topical subheadings / in-infancy-and-childhood
 48 "Sports"/ all topical subheadings / all age subheadings
 49 "Physical-Activity"/ all topical subheadings / all age subheadings
 50 "Physical-Fitness"/ all topical subheadings / all age subheadings
 51 "Exercise"/ all topical subheadings / all age subheadings
 52 explode "Exercise"/ all topical subheadings / in-infancy-and-childhood
 53 "Exertion"/ all topical subheadings / all age subheadings
 54 explode "Exertion"/ all topical subheadings / in-infancy-and-childhood
 55 explode "Physical-Education-and-Training"/ all topical subheadings / all age subheadings
 56 explode "Leisure-Activities"/ all topical subheadings / all age subheadings
 57 explode "Recreation"/ all topical subheadings / all age subheadings
 58 ((sedentary or inactiv*) near3 child*) in ti, ab
 60 ((physical* or sport* or exercise* or game or games) near3 (activit* or exercis* or exert* or fit or fitness or game or games or endur* or inactiv* or educat* or train*)) in ti,ab
 61 #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60
 62 #46 and #47 and #61

ERIC

- 1 exp children/ or child.ab,ti. or children.ab,ti.
 2 Health activities/ or Health education/ or Health programs/
 or Health promotion/ or Health materials/ or Behavior
 change/ or Behavior modification/ or Intervention/ or Crime
 prevention/ or Dropout prevention/ or Prevention/ or
 Preventive medicine/ or Risk management/ or Evaluation/ or

- Formative evaluation/ or Needs assessment/ or Summative evaluation/ or Outcome based education/ or Outcomes of education/ or Program effectiveness/ or promot\$.ti. or increas\$.ti. or prevent\$.ti. or intervention\$.ti. or program\$.ti. or curriculum.ti. or health educat\$.ti. or project\$.ti. or campaign\$.ti. or impact.ti. or reduc\$.ti.
- 3 Disadvantaged/ or Disadvantaged environment/ or Educationally disadvantaged/ or Poverty/ or Poverty areas/ or Unemployment/ or Economically disadvantaged/ or Homeless people/ or Low income groups/ or Low income/ or Lower class/ or Poverty programs/ or Dropout characteristics/ or Dropout prevention/ or Dropout programs/ or Dropouts/ or Out of school youth/ or Potential dropouts/ or Truancy/ or Ethnic stereotypes/ or Racial attitudes/ or Racial discrimination/ or Black stereotypes/ or Cultural differences/ or Ethnicity/ or Disability discrimination/ or Learning disabilities/ or Ghettos/ or Urban population/ or Urban youth/ or risk/ or Delinquency/ or Delinquency prevention/ or Delinquency causes/ or Runaways/ or Youth problems/ or "Adjustment (to environment)"/ or Coping/ or Life satisfaction/ or Happiness/ or Well being/ or Emotional adjustment/ or Social adjustment/ or Social isolation/ or Stress management/ or Stress variables/ or Daily living skills/ or Self esteem/ or Alienation/ or Cultural isolation/ or Student alienation/ or risk factor\$.ti. or vulnerab\$.ti. or resilien\$.ti. or (factor\$ adj protect\$).ti. or protect\$ factor\$.ti. or factors associated.ti. or correlat\$.ti. or predict\$.ti. or predictors.ti. or determinant\$.ti. or self esteem.ti. or self concept.ti. or coping.ti. or well being.ti. or social support.ti. or social support.ti. or empower.ti. or empower\$.ti.
- 4 exp adapted physical education/ or exp health activities/ or exp physical activities/ or exp physical education/ or exp physical recreation programs/ or exp playground activities/ or exp recreational activities/ or exp exercise/ or exp health related fitness/ or exp physical fitness/ or exp physical fitness tests/ or exp physical health/ or exp athletics/ or exp extracurricular activities/ or exp physical activity level/ or exp leisure education/
- 5 exp breakfast programs/ or exp dietetics/ or exp eating habits/ or exp food/ or exp health/ or exp lunch programs/ or exp nutrition/ or exp nutrition instruction/ or exp "recipes (food)"/ or exp vending machines/ or exp obesity/
- 6 2 or 3
- 7 1 and 6 and 4
- 8 British infant schools/
- 12 1 or 8
- 13 limit 12 to yr=1901-2000
- 14 12 and 6 and 7

SSCI

(child OR children* or childhood*) AND ((promot* OR increas* OR interven* OR program* OR curriculum* OR educat* OR campaign* OR impact* OR effect* OR prevent* OR reduc* OR risk factor* OR factors OR correlat* OR predict* OR determinant* OR disadvantag* OR inequalities OR social class OR working class OR high risk OR depriv* OR gender OR low income OR ethnic OR disabilit*) SAME (health* OR ill* OR well or wellbeing or wellness OR poorly or unwell OR disease)) AND (physical activity OR exercise OR leisure OR sport OR fitness OR physical education OR recreation)

PsycInfo

#58 #57 and (PY=1981-2001)
#57 #11 and #44 and #56
#56 #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55
#55 (physical* near3(activ* or health* or exert* or endur* or fit or fitness))in ti,ab
#54 sedentary in ti
#53 ((sedentary or inactiv*) near3 child*)in ti ,ab
#52 leisure time in de
#51 physical education in de
#50 explode recreation
#49 explode physical fitness
#48 explode physical endurance
#47 explode sports
#6 #45 and (PY=1981-2001)
#44 #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43
#43 (barrier* or facilitat* or determin*)in ti
#42 explode teacher attitudes
#41 explode student attitudes
#40 explode racial-and-ethnic-attitudes
#39 explode parental attitudes
#38 ('Obesity-' in DE) or ('Obesity-Attitudes-Toward' in DE))
#37 explode health attitudes
#36 explode eating attitudes
#35 explode community attitudes
#34 explode child attitudes
#33 (social near3 (exclusion or exclude* or disadvantage* or depriv*))in ti,ab
#32 explode self concept
#31 explode socioeconomic class attitudes
#30 explode social class
#29 poverty in de
#28 explode social influences
#27 explode social deprivation
#26 disadvantaged in de
#25 explode dropouts
#24 at-risk-populations in de
#23 educational-program-evaluation in de
#22 explode school environment

#21 explode lifestyle
#20 explode sociocultural factors
#19 risk factors in de
#18 #12 or #13 or #14 or #17
#17 #15 near3 #16
#16 (health* or ill or illness or ills or well or wellbeing or wellness or poorly or unwell or sick* or disease*) in ti,ab
#15 (prevent* or reduc* or promot* or increas* or program* or curricul* or educat* or project* or campaign* or impact* or risk* or vulnerab* or resilien* or factor* or correlate* or predict* or determin* or behav*)in ti,ab
#14 preventive medicine in de
#13 health education in de
#12 explode health promotion in de
#11 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10
#10 explode preschool students in de
#9 explode junior high school students in de
#8 explode elementary school students in de
#7 junior high schools in de
#6 nursery-schools in de
#5 elementary-schools in de
#4 (school near3 (child* or student* or kif or kids or primary or nursery or elementary)) in ti,ab
#3 preschool-age in ag
#2 childhood in ag
#1 school-age in ag

APPENDIX B: Details of sound outcome evaluations: methodology and findings

Author	Design	Comparison groups / Sample size ¹	Follow-up interval	Participation rate Number providing follow-up data (% of those allocated)	Reviewers' judgement about effect on physical activity outcomes
Ford <i>et al.</i> (2002)	RCT	2 groups of children attending clinic, random allocation by individual Intervention group (n= 15 children) Control group (n= 13 children)	Immediately following intervention	Intervention: n= 12 children (80%) Control: n= 15 children (100%)	Effective for increasing reported hours/week participation in organized physical activity No evidence of effect on: * reported hours/wk spent by children using TV, video-tapes, video-games * reported hours/wk family watches TV * reported days/wk when breakfast/dinner eaten in front of the TV * reported hours/wk children playing outside
Gortmaker <i>et al.</i> (1999)	CT	2 groups, control schools matched with intervention schools Intervention group (n= 6 schools n= 319 pupils) ² Control group (n= 8 schools, n= 469 pupils) ²	Unclear, up to six months after end of intervention	Intervention: n= 190 pupils (60%) ³ Control: n= 289 pupils (62%) ³	Effective for knowledge of healthy physical activity No evidence of effect on: * reported hours/day of vigorous activity * reported hours/day of TV and video-game use

APPENDIX B: Details of sound outcome evaluations: methodology (cont'd)

Author	Design	Comparison groups / Sample size ¹	Follow-up interval	Participation rate Number providing follow-up data (% of those allocated)	Reviewers' judgement about effect on physical activity outcomes
Luepker et al. (1996)	RCT	2 groups, random allocation by school Intervention group (n=56 schools, n= 2989 pupils) Control group (n= 40 schools, n= 2117 pupils)	Immediately following end of intervention and at 1, 2 and 3 years after end of intervention	All schools remained in the evaluation At end of intervention Intervention: n= 2366 pupils (79%) Control: n= 1653 pupils (78%) 3 years after intervention end ⁴ Intervention: n= 2152 pupils (72%) Control: n= 1502 pupils (71%)	Effective for increasing % of school PE lessons spent in moderate to vigorous physical activity (at end of intervention) Effective for increasing: * reported total time spent in physical activity (for end of intervention and 1 year follow-up only) * reported time spent in vigorous physical activity (all follow-ups) No evidence of effect (at any follow-up point) on: * physical activity self-efficacy * perceptions of positive social support for physical activity

APPENDIX B: Details of sound outcome evaluations: methodology (cont'd)

Author	Design	Comparison groups / Sample size ¹	Follow-up interval	Participation rate Number providing follow-up data (% of those allocated)	Reviewers' judgement about effect on physical activity outcomes
Robinson (1999)	RCT	2 groups, random allocation by school Intervention group (n= 1 school, n= 106 pupils); Control group (n= 1 school, n= 121 pupils)	Within one month of end of intervention	Intervention: n= 92 pupils (87%) Control: n= 100 pupils (83%)	Effective for reducing: * reported hrs/wk TV viewing * reported hrs/wk video-game use * reported number of meals eaten in front of TV No evidence of effect on reported hrs/wk video-tape use
Walter et al. (1988)	RCT	2 groups, random allocation by school Intervention group (n= 14 schools, n= 1117 pupils) ⁵ Control group (n= 8 schools, n= 446 pupils) ⁵	At end of intervention	All schools remained in the evaluations At end of intervention: Intervention and control ⁶ : n= 1036 pupils	Effective for increasing health knowledge

1 Number of individuals allocated unless specified otherwise

2 Numbers are for individuals providing baseline data

3 Percentage of individuals present at baseline

4 Numbers are for those providing data on self-efficacy and social support. Response rate for reports of physical activity levels was 66% for both intervention and control groups

5 Numbers are for individuals providing baseline data – 32% of pupils allocated did not provide baseline data

6 Since figures are not available for numbers of pupils allocated to intervention and control groups, percentage participation has not been calculated

APPENDIX C: Details of sound outcome evaluations: study characteristics

Author	Country	Population	Setting	Objectives	Providers	Programme Content
Ford et al. (2002)	USA	African American children aged 7-12 (mean 9.6 years) attending for health supervision	* Primary care clinic serving low income population * Home	To reduce TV, video and video-game use	* No detail on who worked with families during their clinic visit * Parents were enlisted to help children budget their TV use	* Intervention delivered over 4 weeks * Both intervention and control group families were involved in a 5-10 minute discussion of potential problems of excessive TV use and were given brochures from the American Academy of Pediatrics * Intervention group also: (i) took part in a further 10 minutes discussion on setting TV budgets, using 'A parents Guide to Reducing Children's TV Viewing'; and (ii) received an electronic TV time manager for home use
Gortmaker et al. (1999)	USA	4 th grade pupils (mean 9.2 years at start of intervention)	Public elementary schools serving predominantly African American, low-income pupils	* To provide a low-cost and sustainable intervention that could improve the diet and physical activity of students * To decrease consumption of foods high in total and saturated fat, increase consumption of fruits and vegetables to 5/day or more, reduce TV viewing to 2 hours/day, increase moderate and vigorous physical activity, increase student knowledge of healthy diet and activity change	* Lessons taught by classroom teachers	* Eat Well and Keep Moving * Intervention delivered over 2 school years * Classroom-based healthy eating and physical activity units, integrated into existing classes, designed to be taught as part of regular curriculum. 13, 50 minute lessons given each year * Lessons used printed cards to introduce pupils to menu items from school food service menu * Classroom-based campaigns focused on: promoting fruit and vegetables, limiting TV viewing time, increased walking * Classroom teachers attended one day of teacher training and two staff 'wellness' meetings each year * Campaigns included activities at home * Links with organizations able to provide free/low-cost nutrition/physical activity programmes for parents * No detail on control group's experience during evaluation

APPENDIX C: Details of sound outcome evaluations: study characteristics (cont'd)

Author	Country	Population	Setting	Objectives	Providers	Programme Content
Luepker <i>et al.</i> (1996)	USA	3 rd grade pupils (mean 8.8 years at start of intervention)	* "Ethnically diverse" public elementary schools * Home	To prevent cardiovascular disease through changes in children's eating habits, physical activity patterns and smoking onset, by modifications in the most potent and predictive psychosocial risk factors	* Lessons taught by classroom teachers * PE specialists and school food personnel also involved in developing school services * Parents participate in children's homework	* Child and Adolescent Trial for Cardiovascular Health (CATCH) * Intervention delivered over 3 school years * Half the intervention schools experienced school and home-based components, half experienced school-based components only * School-based components - school food service modifications to lower total fat and sodium, PE lesson interventions to increase % time spent in moderate to vigorous physical activity and CATCH curricula of 15-24, 30-40 minute lessons per year. Curricula targeted psychosocial factors and involved skills development focused on eating behaviours and physical activity patterns. * Classroom teachers attended one-to one and a half days of teacher training/year * Home-based components - take home activity packets requiring adult participation, score cards as rewards, 'family fun nights' with dance performances, food booths, distribution of recipes and games * Control group received the usual health curricula

APPENDIX C: Details of sound outcome evaluations: study characteristics (cont'd)

Author	Country	Population	Setting	Objectives	Providers	Programme Content
Robinson (1999)	USA	3 rd and 4 th grade pupils (mean 9.0 years at start of intervention)	Public elementary school Home	<ul style="list-style-type: none"> * To reduce adiposity, by reducing television, video-tape and video-game use * To decrease media use alone without specifically promoting more active behaviours as replacements 	<ul style="list-style-type: none"> * Lessons taught by classroom teachers * Parents encouraged to help their children to budget time spent using TV 	<ul style="list-style-type: none"> * Intervention delivered over 6 months * Classroom component - 18 30-50 minute lessons incorporated into standard curriculum. * Resource component - each household received an electronic TV time manager (as for Ford <i>et al.</i>, above) * Early lessons included self-monitoring/reporting of TV viewing, video-tape and video-game use * Followed by 'TV turn off', where children challenged to watch no TV or video and use no video-games for 10 days * Children then encouraged to follow a 7 hour/wk budget * Newsletters designed to motivate parents and provide them with strategies to help their children stay within their time budgets and reduce TV use for whole family * Control group received assessments only * Teachers were trained by the research staff (no further details)

APPENDIX C: Details of sound outcome evaluations: study characteristics (cont'd)

Author	Country	Population	Setting	Objectives	Providers	Programme Content
Walter <i>et al.</i> (1988)	USA	4 th grade pupils (mean 9.0 years at start of intervention)	Elementary and junior high schools	Favourably to modify the population distributions of risk factors for CHD and cancer (hypercholesterolaemia, hypertension, exposure to cigarette smoke, obesity, and poor physical fitness) through changes in behavioural antecedents of the risk factors (diet, physical activity, smoking)	<ul style="list-style-type: none"> * Lessons taught by classroom teachers * Health and education professionals conducted risk factor examination screening 	<ul style="list-style-type: none"> * Know Your Body * Intervention delivered over 5 years * Classroom component - 2 hours a week of education on healthy eating, promotion of physical activity, and targeting of beliefs and attitudes around smoking. Classroom teachers attended teacher training * Parental involvement component - parents received newsletters about their children's activities; took part in food surveys and family exercise days, as well as evening seminars * Risk factor examination component - students' height, weight, skinfold thickness, blood pressure, post exercise pulse rate and cholesterol levels were measured and results fed back to them using 'health passports'. Teachers discussed the results with the pupils in the classroom in terms of setting behavioural goals

APPENDIX D: Details of studies of children's views: methodology

Study	Sample selection and recruitment	Data collection (instrument/setting/reliability/validity)	Data analysis (approach/reliability/validity)	Extent to which principles for conducting research with children were followed
Burrows et al. (1999)	<ul style="list-style-type: none"> * All schools teaching 6 to 11 year old children in the Watford area of south-east England were invited to participate and 10 schools agreed. * Questionnaires were administered to all children in years 2 (6 to 7 years); 4 (8 to 9 years); and 6 (10 to 11 years). * Those who provided written comments to the open-ended question at the end of the questionnaire formed the sample for the study 	<ul style="list-style-type: none"> * The 'draw and write' technique was employed which asked children 'Is there anything you would like to write or draw about exercise' at the end of the larger questionnaire * Children responded to this question individually in their usual classrooms at school. * A pre-prepared script was used to help children fill in the larger questionnaire * When piloting the larger questionnaire, authors found that children often used drew pictures and provided extra written comments 	<ul style="list-style-type: none"> * Children's written responses were coded according to whether they reflected one of five 'motivational factors' for physical activity or one of nine 'barriers to participation' * Two researchers coded responses independently and agreement between raters was reported to be high * Validity of data analysis not addressed 	<ul style="list-style-type: none"> * 'Draw and write' technique specifically adopted for its suitability for research with children * Only parental consent was sought. * Authors stated that no pressure was put on the children to complete the questionnaire, but no assurances of confidentiality appear to have been given * Limited information provided on how children were informed about the research (e.g. whether they had any opportunities to ask questions). * Those children with literacy problems are likely to have been excluded (time constraints; reliance on written comments rather than drawings) * Children's views analysed with a pre-determined framework developed with adults * No details on whether results were fed back to children

APPENDIX D: Details of studies of children’s views: methodology (cont’d)

Study	Sample selection and recruitment	Data collection (instrument/setting/reliability/validity)	Data analysis (approach/reliability/validity)	Extent to which principles for conducting research with children were followed
<p>Davis and Jones (1996)</p>	<p>* Four Birmingham schools selected but unclear how they were selected * Teachers selected children from years 6, 5 or 9 who were ‘non-antagonistic’ towards each other to take part in focus groups.</p>	<p>* Focus groups (average length of sessions was 50 minutes) held within the school * Topics for discussion included getting around, using local areas, perceptions of risk and ideas for change. * All discussions were tape recorded * Validity of data collection methods not addressed.</p>	<p>* Analysis methods not described * Reliability and validity of data analysis not addressed</p>	<p>* Focus group research method specifically selected for its suitability for allowing children to talk freely * Authors state that they took steps to minimise power inequalities between the researchers and the children * Unclear if consent was sought from children or their parents * No assurances of confidentiality appear to have been given. * Limited information provided on how children were informed about the research (e.g. whether they had any opportunities to ask questions). * No details on whether results were fed back to children</p>
<p>Mason (1995)</p>	<p>* Ten areas in rural and urban England selected to give a regional mix from north to south and east to west. * Interviewers were asked to visit areas near the specified schools, and to contact households with the aim of achieving a certain quota of children representative of age, sex and ‘keenness on sport’ (p.63). * Participants were recruited face-to-face.</p>	<p>* One to one interviews, in person or by phone carried out in children’s homes * Parents present throughout interview, and sometimes helped the child with their answers. * Topics for discussion included general discussion of school subjects and leisure pursuits, sports they liked and disliked and the reasons why, and sports done in and out of school lessons in the last year * Author reports that ‘trained and experienced’ data collectors were used and the use of prompt cards ensured that all relevant topics were covered. Also, all discussions were tape recorded. * Validity of data collection method not addressed.</p>	<p>* Interview transcripts were analysed for main themes and issues. * Reliability and validity of data analysis not addressed.</p>	<p>* Interviews used to explore children’s views in-depth. * Parental presence throughout most interviews and sometimes help with children’s answers may have influenced children’s responses. * Only parental consent was sought. * No details provided on how the children were informed about the research. * No details on whether results were fed back to children for confirmation.</p>

APPENDIX D: Details of studies of children’s views: methodology (cont’d)

Study	Sample selection and recruitment	Data collection (instrument/ setting/reliability/validity)	Data analysis (approach/ reliability/validity)	Extent to which principles for conducting research with children were followed
Mulvihill et al. (2000)	<ul style="list-style-type: none"> * Schools in rural and urban settings in the North, Midlands and South of England were purposively selected to reflect diversity of socio-economic background and ethnicity * Teachers in these schools were asked to identify equal numbers of ‘active’ and ‘inactive’ children * It is unclear how parents were recruited, but they were offered a small payment 	<ul style="list-style-type: none"> * ‘Paired’ interviews for children with another child of the same age and sex, conducted in schools. ‘Draw and write’ technique also employed * Focus groups with parents (unclear where these were carried out) * Questions covered: understanding and importance of physical activity; preferred activities; gender differences; the role of school, family and friends; barriers and motivations. * Reliability of data collection method not addressed. * Interview guides for children were piloted with two pairs of primary school children. 	<ul style="list-style-type: none"> * Data were analysed thematically according to the main aims and objectives of the study. Tapes were reviewed to clarify particular points and to identify suitable quotations from respondents * Issues of reliability and validity of data analysis not addressed 	<ul style="list-style-type: none"> * ‘Draw and write’ technique used for its suitability for research with children * Author stated that focus groups specified a number of topics to be explored at the course of the interview, but allowed children participating in the study to exert an influence over the choice of issues that were talked about, and their relevance to the individual * Children interviewed in pairs matched for activity level * Consent was not sought, however participants were assured of their right to withdraw from the study at any time without any explanation * Assurances of confidentiality were made. * No details provided on how the children were informed about the research. * No details on whether results were fed back to children for confirmation.
Tuxworth (1997)	<ul style="list-style-type: none"> * Schools were selected who were in contact with St Edmundsbury borough council. Other schools were selected to balance the sample in terms of age, school location and the socioeconomic backgrounds served * No detail on how these schools were recruited to take part * Within each selected primary, middle and upper school, children from the last year were chosen to participate * Schools provided one or two entire classes for surveying * Recruitment of children was not described. 	<ul style="list-style-type: none"> * ‘Lifestyle questionnaires’ with fixed response and some open-ended questions, administered within the children’s schools. * Questionnaires focused on children’s views on physical activity outside of the school * Children were helped to fill in the questionnaire by sports officers * The same team administered the questionnaires at all schools in all three years to ensure consistency * Pilot survey was undertaken which was originally devised by representatives of various local agencies, and underwent minor modifications each year to improve its focus on children’s views 	<ul style="list-style-type: none"> * Descriptive statistics were used to summarise responses to questions * Differences between groups of children were examined for their significance using inferential statistics (t-tests or analysis of variance). 	<ul style="list-style-type: none"> * Author did not provide any details on whether/how the questionnaire was devised for or with children * Author noted that the length of the questionnaire may have put off some children from answering all questions * Consent procedures were not described. * Assurances of confidentiality do not appear to have been made. * No details were provided on how the children were informed about the research. * No details were provided on whether the findings were fed back to children

APPENDIX E: Details of studies of children’s views: aims, sample, findings and quality

Study	Aims	Sample characteristics	Findings (as judged by reviewers)	Quality
Burrows et al. (1999)	<ul style="list-style-type: none"> * To assess children’s beliefs about exercise. * To compare the beliefs of children with those of adults. * To examine gender differences in beliefs 	<p>Location: South-east England (Watford area) Sample number: 74 Age range: 6 to11 years Gender: Mixed (23 boys, 51 girls) Class: Not stated Ethnicity: Not stated Other information: Sample is taken from 5 state and 5 private schools. Two schools were single sex Exclusions: None stated, although it is likely that those with literacy problems would have had insufficient time to complete the questionnaire</p>	<p>Barriers <i>Children described the following</i> (starting with the most frequently expressed):</p> <ul style="list-style-type: none"> * Motivational barriers (having no energy; not enjoying physical activity; rather do something else); * Lack of time; * Physical barriers such as illness or injury; * Availability of facilities <p>Facilitators <i>Children described the following as ‘motivating factors’</i> (starting with the most frequently expressed)</p> <ul style="list-style-type: none"> * It is fun (expressed by boys more then girls) * It keeps you in good shape (expressed by girls more then boys) * It is healthy (expressed by girls more then boys) * It can help weight control (expressed by girls more then boys) * It gives a sense of achievement (no gender differences) 	<p>Quality of reporting* D</p> <p>Adequacy of strategies to enhance reliability/validity** H, I, J</p> <p>Appropriateness of study methods for ensuring findings rooted in children’s own perspectives*** L</p>

***Key**

- A. Aims and objectives were clearly stated.
- B. There was an adequate description of the context of the study.
- C. Sufficient justification was given for how the study was carried out.
- D. There was a clear description of sampling methods and the sample.
- E. There was a clear description of data collection methods.
- F. There was a clear description of data analysis methods.
- G. Sufficient original data were presented to mediate between data and interpretation.

****Key**

- At least some attempt to establish the:
- H. Reliability of data collection tools
 - I. Validity of data collection tools
 - J. Reliability of the data analysis methods
 - K. Validity of data analysis methods

*****Key**

- L. Used appropriate data collection methods for helping children to express their views
- M. Used appropriate methods for ensuring the data analysis was grounded in the views of children.
- N. Actively involved children to an appropriate degree in the design/conduct of the study.

APPENDIX E: Details of studies of children’s views: aims, sample, findings and quality (cont’d)

Study	Aims	Sample characteristics	Findings (as judged by reviewers)	Quality
<p>Davis and Jones (1996)</p>	<p>*To understand children’s perceptions of risk and patterns of decision making on how they get around their local environment</p>	<p>Location: schools in Birmingham England Sample number: Not stated for 9 to 11 year olds, although 138 took part in focus groups. Age range: 9 to 11 and 13 to 14 years. Data extracted on 9 to 11 year old group Gender: Both boys and girls, sex not further specified Class: ‘Broadly working class’; sample came from areas with higher unemployment rates and lower income levels than average for Birmingham Ethnicity: Unclear Other information: Densely populated area with extensive older terraced housing, narrow streets and high levels of traffic Exclusions: None stated.</p>	<p>Barriers <i>Children described the following:</i> * Dangers in their local environment as restricting their ability to cycle, walk or play in their local area: * busy traffic * the threat of crime * the threat of intimidation by older children * neglect of local play areas (e.g. glass, graffiti) * Parental-imposed restrictions as a result of the above. * Recognition of the distinct advantages of car travel for quick and efficient travel across short distances (rather than walking or cycling). Facilitators None identified.</p>	<p>Quality of reporting* A,C,G Adequacy of strategies to enhance reliability/validity** H Appropriateness of study methods for ensuring findings rooted in children’s own perspectives*** L</p>

***Key**

- A. Aims and objectives were clearly stated.
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- F. There was a clear description of data analysis methods.
- G. Sufficient original data were presented to mediate between data and interpretation.

****Key**

- At least some attempt to establish the:
- H. Reliability of data collection tools
- I. Validity of data collection tools
- J. Reliability of the data analysis methods
- K. Validity of data analysis methods

*****Key**

- L. Used appropriate data collection methods for helping children to express their views
- M. Used appropriate methods for ensuring the data analysis was grounded in the views of children.
- N. Actively involved children to an appropriate degree in the design/conduct of the study.

APPENDIX E: Details of studies of children’s views: aims, sample, findings and quality (cont’d)

Study	Aims	Sample characteristics	Findings (as judged by reviewers)	Quality
Mason (1995)	* To explore children’s views on participation in sport in order to understand the personal and social influences which affect their involvement	Location: Residential areas located near selected UK primary, middle and secondary schools. Sample number: 17 Age range: 6 to 11 years (although entire sample was aged 6 to 16 years). Gender: Mixed sex (9 boys, 8 girls) Class: Not stated. Ethnicity: Not stated. Other information: None stated. Exclusions: None stated.	Barriers <i>Children described the following</i> * Not enjoying ‘sport’ or ‘exercise’. Lack of enjoyment was related to a number of issues: * a belief that their particular physique or co-ordination skills were not well suited to a particular sport; * shame and embarrassment that they had let the ‘team’ down or as a result of critical comments by friends; * a frustration with complex or unclear rules, often compounded by having to play a sport before they had time to learn such rules; * boredom; and * playing sport in bad weather * A preference for doing other things (e.g. watching TV, music or computer games) <i>Parents described the following</i> * Children’s health problems (e.g. asthma) * Concerns about the safety of children when on their own/with friends * The complexities and burden of transporting children to sports facilities * The cost of sports activities (reported by parents with a lower income) * Their own lack of participation in, or enthusiasm for, sports. Facilitators <i>Children described the following</i> * Having a range of activities available to make a choice according to their particular needs and preferences * Having fun and enjoying oneself * Gaining a sense of belonging to a team and achievement and opportunities for competition (for those who excelled at sport) * Opportunities for spending time with friends * Parental enthusiasm, encouragement and practical support for their sporting activities * Encouragement from friends and siblings * A chance to forget worries and troubles <i>Parents described the following</i> * Innate abilities for sport * Their own enthusiasm, encouragement and practical support. Ideas to promote physical activity <i>Children and parents described the following</i> * Better access to school facilities outside of school lessons * More extra-curricular activities after school	Quality of reporting* A,C,E,G Adequacy of strategies to enhance reliability/ validity** H Appropriateness of study methods for ensuring findings rooted in children’s own perspectives*** L

***Key**

- A. Aims and objectives were clearly stated.
- B. There was an adequate description of the context of the study.
- C. Sufficient justification was given for how the study was carried out.
- D. There was a clear description of sampling methods and the sample.
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- G. Sufficient original data were presented to mediate between data and interpretation.

At least some attempt to establish the:

- H. Reliability of data collection tools
- I. Validity of data collection tools
- J. Reliability of the data analysis methods
- K. Validity of data analysis methods

*****Key**

- L. Used appropriate data collection methods for helping children to express their views
- M. Used appropriate methods for ensuring the data analysis was grounded in the views of children.
- N. Actively involved children to an appropriate degree in the design/conduct of the study.

APPENDIX E: Details of studies of children’s views: aims, sample, findings and quality (cont’d)

Study	Aims	Sample characteristics	Findings (as judged by reviewers)	Quality
<p>Mulvihill et al. (2000)</p>	<p>*To explore factors influencing children’s involvement in physical activity</p>	<p>Location: Six UK sites that covered a range of urban and rural settings in the North (Manchester and Durham), Midlands (Leicester and Birmingham) and South (London and Devon) of England Sample number: 60 children; 38 parents Age range: Children aged 5 to 11; parental age not specified Gender: 30 girls and 30 boys ten from each of Year 1 to Year 6; parents were mostly women Class: Not stated, although authors did try to recruit a diverse group Ethnicity: Not stated, although authors did try to recruit a diverse group Other information: 44 children were ‘active’ and 16 ‘very active’ according to their teachers. Exclusions: None</p>	<p>Barriers <i>Children described the following:</i> * Lack of their own or parents’ time * Parental restrictions on children’s activity choice due to safety concerns * Preference for other activities amongst older girls (e.g. talking to friends) <i>Parents described the following:</i> * Their own experiences of PE as children * A lack of their own time * Volume and speed of local traffic * Safety concerns about play areas and poor park conditions * Difficulties with organising transportation * Cost of organised sports and other activities</p> <p>Facilitators <i>Children described the following:</i> * Parents who supported their participation. * The benefits of being a team member; opportunities to compete and feeling a sense of achievement (for those children already engaged in high levels of physical activity) * Having fun and enjoying oneself * Opportunities for spending time with friends <i>Parents described the following</i> * Rural parents felt that their location gave their children more chance to be active outdoors * Being able to drive and having access to a car and a garden * Their own positive and negative experiences of PE as children</p> <p>Ideas for promoting physical activity <i>Parents described the following:</i> * Better provision of facilities such as youth clubs for children to meet, especially in bad weather * Better parks and play areas * Improved cycle paths</p>	<p>Quality of reporting* A,B,C,D,E,G</p> <p>Adequacy of strategies to enhance reliability/validity** I</p> <p>Appropriateness of study methods for ensuring findings rooted in children’s own perspectives*** L, N</p>

***Key**

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- K. Validity of data analysis methods

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- M. Used appropriate methods for ensuring the data analysis was grounded in the views of children.
- N. Actively involved children to an appropriate degree in the design/conduct of the study.

APPENDIX E: Details of studies of children’s views: aims, sample, findings and quality (cont’d)

Study	Aims	Sample characteristics	Findings (as judged by reviewers)	Quality
Tuxworth (1995)	* To examine the physical fitness and lifestyle patterns of young people in St. Edmundsbury, Suffolk	Location: Primary, middle and secondary schools in St. Edmundsbury, UK, a rural region Sample number: 405 nine year olds (out of a total sample of 1140 nine, 13 and 15 year olds) Age range: 9 years Gender: Mixed sex (195 girls and 210 boys) Class: Not stated, although authors tried to recruit diverse groups. Ethnicity: Not stated Other information: None stated Exclusions: None	Barriers <i>Children described the following:</i> * Lack of interest in sport (34% of those not participating in activities outside of school lessons); * Lack of spare time (27%, although for 9 year olds this figure was only 6%) * Lack of money (11%) * Lack of transport (7%) * Friends are not interested (7%) * No local facilities (7%) * Children from rural areas more likely than urban children to report 'lack of transport' as a reason for non-participation (15% v 2%), and children from urban areas were more likely to report 'lack of money' (22% v 2%) Facilitators <i>Children described the following:</i> * Enjoyment (86%) * To keep fit (45%) * Friends were participating (14%) * Family encouraged them to (8%) * Opportunity to do things with other members of the family (8%).	Quality of reporting* A,B,C,E,G Adequacy of strategies to enhance reliability/ validity** H,I Appropriateness of study methods for ensuring findings rooted in children’s own perspectives*** None met

***Key**

- A. Aims and objectives were clearly stated.
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- L. Used appropriate data collection methods for helping children to express their views
- M. Used appropriate methods for ensuring the data analysis was grounded in the views of children.
- N. Actively involved children to an appropriate degree in the design/conduct of the study.

APPENDIX F: Synthesis matrix

Physical activity, valued aspects, preferences, and priorities

Children's/parents' views on barriers and facilitators		Interventions included in in-depth review which address barriers or build on facilitators identified by children/parents	
Barriers	Facilitators	Soundly evaluated interventions	Not soundly evaluated interventions
<p>That stop children taking part in physical activity</p> <ul style="list-style-type: none"> * Children's physique, coordination or skills (V3, V5) * Shame and embarrassment at letting the team down (V3) * Frustration with unclear or complex rules (V3) * Boredom (V5) * Bad weather (V3) * Preferring to do other things over sport (e.g. TV, music, computers) (V1, V3, V5) * Lack of spare time for activity (V1, V4, V5) * Lack of choice, variety (V3) * Illness or injury (V1, V3) 	<p>That help children to take part in physical activity</p> <ul style="list-style-type: none"> * Sports providing a sense of achievement and belonging (V3, V4) * Enjoying competition (V4) * Having fun (V1) * Being fit, healthy, in good shape (V1) * Spending time with friends and family members (V3, V4) * Choosing activities they prefer (V3) * Choosing activities suited to their physique or skill level (V3) * Choosing a variety of activities (V3) 	<p>Two interventions focused on helping children budget their TV, video and video-game use (OE1, OE2). One (OE2) was effective for reducing reported hours/week of both TV and video viewing, although it was not evaluated in terms of whether it helped children increase their physical activity levels per se. No evidence of effect on TV, video or video-game use was found for the other (OE1), although it was found to be effective for increasing children's reported hours per week participation in organized physical activity.</p> <p>The 'Eat Well and Keep Moving' and USA 'Know Your Body' interventions included components where children took part in physical activity sessions alongside other members of their families, although it is not clear what level of participation there was by family members (OE2, OE5).</p>	<p>Children's concerns over their own physique and a sense of belonging might have been addressed in part by an intervention that aimed to increase acceptance among children of diverse shapes and types of bodies (OE18).</p> <p>Problems with complex rules and boredom and concerns over physique, co-ordination or skills might have been addressed by the 'PLAY' intervention's approach to promoting physical activity (OE10). This used 15 minute activity breaks', run by teachers and including a "variety of enjoyable, easy activities" as an attempt to involve children in movement of any sort, rather than in any specific, or high intensity physical activity.</p> <p>Choice was a specific feature of one intervention (OE15), where children were encouraged to select their own fitness activities as part of a personalised fitness module.</p> <p>The social aspects of physical activity were specifically targeted by one intervention (OE8), a community-based family fitness programme which described itself as aiming "to provide an attractive social environment" and encouraged socializing during the exercise sessions. Children attended with their families, so it is unclear how much this intervention would have built on the value attached by children to taking part in physical activity with friends.</p>

Key to young people's views studies

- (V1) Burrows *et al.* (1999)
- (V2) Davis and Jones (1996)
- (V3) Mason (1995)
- (V4) Mulvihill *et al.* (2000)
- (V5) Tuxworth (1997)

Key to intervention studies - *denotes a sound outcome evaluation

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|---------------------------------------|---------------------------------------|--|
| (OE1) *Ford <i>et al.</i> , 2002 | (OE8) Baranowski <i>et al.</i> , 1990 | (OE15) Mott <i>et al.</i> , 1991 |
| (OE2) *Gortmaker <i>et al.</i> , 1999 | (OE9) Davis <i>et al.</i> , 1995 | (OE16) Parcel, 1989 |
| (OE3) *Luepker <i>et al.</i> , 1996 | (OE10) Ernst and Pangrazi, 1999 | (OE17) Sahota <i>et al.</i> , 2001 |
| (OE4) *Robinson, 1999 | (OE11) Harrell <i>et al.</i> , 1998 | (OE18) Smolak, 1998 |
| (OE5) *Walter <i>et al.</i> , 1988 | (OE12) Howard, 1996 | (OE19) Stratton, 2000 |
| (OE6) Abbott and Farrell, 1989 | (OE13) Kelleher <i>et al.</i> , 1999 | (OE20) Walter, 1989 |
| (OE7) Balding, 2000 | (OE14) Manios <i>et al.</i> , 1999 | (OE21) Zonderland <i>et al.</i> , 1994 |

APPENDIX F: Synthesis Matrix (cont'd)
Physical activity, family life and parental support

Children's/parents' views on barriers and facilitators		Interventions (included in in-depth review) which remove/reduce barriers or build on facilitators identified by children/parents	
Barriers	Facilitators	Soundly evaluated interventions	Not soundly evaluated interventions
<p>That stop children taking part in physical activity</p> <p>* Parents relying on cars to drive short distances (V2)</p> <p>* Parents' own perceptions of their lack of participation in or enthusiasm for sport (V3)</p> <p>* Parents' own negative childhood experiences of PE (V4)</p>	<p>That help children to take part in physical activity</p> <p>* Parents paying for sporting activities (V3)</p> <p>* Parents transporting children to and from activities (V3)</p> <p>* Parents recognising and supporting children's abilities and potential early in life (V3)</p> <p>* Parents' enthusiasm and encouragement (V3, V4)</p> <p>* Parents' own physical activity levels and interest (V3)</p> <p>* Parents' own positive childhood PE experiences (V4)</p> <p>* Siblings taking part in sport (V3)</p>	<p>All five of the soundly evaluated interventions included components meant to involve families in their children's learning about the health benefits of physical activity, but none of the evaluations examined the impact of this on parent's attitudes or knowledge about physical activity. While several of these interventions were found to have an effect on physical activity levels or motivating factors, it is unclear whether the parental involvement component was itself influential.</p> <p>Parents' own physical activity levels and interest might have been influenced by one intervention's provision of information about organisations offering parents free or low-cost physical activity programmes (OE2). Uptake of these programmes was not examined as part of this evaluation, so it is unclear whether they would enable parents or their children to exercise. Taken as a whole, this intervention was effective in influencing children's knowledge of healthy physical activity.</p>	<p>Free transport for families was provided in one intervention (OE8).</p> <p>In one intervention (OE9), children were encouraged to interview older members of their family to ask them about their experiences of physical activity. The authors noted that previous generations of the Native American groups involved with this intervention had higher levels of physical activity as children and that contact with family members and tribal elders would help children learn the importance of physical activity within their own culture.</p> <p>Several interventions aimed to involve parents in their children's learning, using newsletters, homework activities and/or invitations to student assemblies (OE6, OE18, OE20).</p> <p>A community-based family fitness programme (OE8), was the only intervention that directly aimed to improve parent's activity levels.</p>

Key to young people's views studies

- (V1) Burrows *et al.* (1999)
- (V2) Davis and Jones (1996)
- (V3) Mason (1995)
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- (V5) Tuxworth (1997)

Key to intervention studies - *denotes a sound outcome evaluation

- | | | |
|---------------------------------------|---------------------------------------|--|
| (OE1) *Ford <i>et al.</i> , 2002 | (OE8) Baranowski <i>et al.</i> , 1990 | (OE15) Mott <i>et al.</i> , 1991 |
| (OE2) *Gortmaker <i>et al.</i> , 1999 | (OE9) Davis <i>et al.</i> , 1995 | (OE16) Parcel, 1989 |
| (OE3) *Luepker <i>et al.</i> , 1996 | (OE10) Ernst and Pangrazi, 1999 | (OE17) Sahota <i>et al.</i> , 2001 |
| (OE4) *Robinson, 1999 | (OE11) Harrell <i>et al.</i> , 1998 | (OE18) Smolak, 1998 |
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| (OE6) Abbott and Farrell, 1989 | (OE13) Kelleher <i>et al.</i> , 1999 | (OE20) Walter, 1989 |
| (OE7) Balding, 2000 | (OE14) Manios <i>et al.</i> , 1999 | (OE21) Zonderland <i>et al.</i> , 1994 |

APPENDIX F: Synthesis Matrix (cont'd)

Physical activity and access

Children's/parents' views on barriers and facilitators		Interventions (included in in-depth review) which remove/reduce barriers or build on facilitators identified by children/parents	
Barriers	Facilitators	Soundly evaluated interventions	Not soundly evaluated interventions
<p>That stop children taking part in physical activity</p> <p><i>In structured activities:</i></p> <ul style="list-style-type: none"> * Cost (V3, V5) * Distance (V3, V4, V5) * Availability (V1, V4, V5) <p><i>In unstructured activities:</i></p> <ul style="list-style-type: none"> * Threat of crime (e.g. fear of assault, bike theft) (V2, V4) * Threat of intimidation by older children (V2) * Neglect of play areas (e.g. glass, graffiti, dog mess) (V2, V4) 	<p>That help children to take part in physical activity</p> <p><i>In structured activities:</i></p> <ul style="list-style-type: none"> * None identified <p><i>In unstructured activities:</i></p> <ul style="list-style-type: none"> * Parents identified their rural location to be of benefit (V4) <p>That children/parents think could or should be done</p> <p><i>For structured activities:</i></p> <ul style="list-style-type: none"> * Make school facilities more available in out of school hours (V3) * Provide children with more information on extra-curricular activities (V3) <p><i>For unstructured activities:</i></p> <ul style="list-style-type: none"> * Clean up parks, re-establish park wardens (V3) * Provide more cycle paths (V3) * Provide youth clubs (V3) 	<p>No interventions aimed to increase children's access to facilities for physical activity.</p>	<p>School facilities were provided out of school hours by one intervention (OE21).</p> <p>Two interventions, both UK-based, aimed to make improvements to school playgrounds (OE17, OE19)</p> <p>One UK-based intervention (OE7) created formal links between local authority leisure services, schools so as to provide children with free access to leisure centres and improved information about local facilities.</p>

Key to young people's views studies

(V1) Burrows *et al.* (1999)
 (V2) Davis and Jones (1996)
 (V3) Mason (1995)
 (V4) Mulvihill *et al.* (2000)
 (V5) Tuxworth (1997)

Key to intervention studies - *denotes a sound outcome evaluation

(OE1) *Ford *et al.*, 2002
 (OE2) *Gortmaker *et al.*, 1999
 (OE3) *Luepker *et al.*, 1996
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 (OE15) Mott *et al.*, 1991
 (OE16) Parcel, 1989
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