Primary School Factors associated with Children's Physical Activity in the Outdoor Environment: A mixed-methods study to inform the development of a Quality of Outdoor Environment Survey

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THESIS SUMMARY

Recent data from the National Child Measurement Programme in England (2019-2020) shows that over a third of children aged 10-11 and more than a fifth of children aged 4-5 are overweight or obese. There is a need to implement strategies to reduce this prevalence in children in order to limit associated health problems now and in the future. Physical activity is thought to play a crucial role in the management of childhood obesity. However, despite the considerable benefits to children's health, proportions of young people meeting WHO guidelines for PA levels are low across the world. Schools are thought to be ideally placed to promote children's PA and may be able to utilise the outdoor environment for encouraging children to be active.

The purpose of the thesis was to gain a deeper understanding of primary school factors involved with promoting children's physical activity in the outdoor environment and to use this knowledge to inform the development of a school survey for evaluating primary school provision for children's physical activity in the outdoor environment. As there is no fully comprehensive picture to date of the school factors thought to be important for encouraging young people to be active when they are outside, a literature review was conducted, including qualitative, interventional and observational studies so as to gain a wide perspective on the subject. The literature review highlighted a need for further qualitative work to explore the ways in which school factors might either deter children from being active or facilitate their active behaviours.

Children's perceptions of their own PA behaviours were considered to be crucial for forming a deeper understanding of how schools might best intervene to facilitate these behaviours. Whilst focus groups and individual interviews have increasingly been used to explore health-related issues with children, the rationale for choosing any one method is not often explained and despite considerable debate about their benefits and drawbacks these methods have rarely been compared directly. To address these issues, the relative merits of focus groups and individual interviews when collecting information from children about their perceptions of PA were compared. Although both methods were found to be suitable, content analysis showed that children who were interviewed spoke on more occasions and

offered more information about facilitators for physical activity. They also spoke more frequently about potentially important aspects of the school outdoor environment with regard to PA promotion.

Subsequently, individual interviews were implemented with children and adults at 4 Nottinghamshire primary schools to gain more understanding about their perceptions and observations of aspects of school provision which might influence pupils to be active in the outdoor environment. Content analysis identified equipment, games/activities and active transport strategies thought to be important by the school community. Through a thematic analysis, nine themes were identified in the remaining data which encompassed ideas involving space, safety, peer influence, adult presence, equipment provision and variety, outdoor learning, football and school actions.

Findings from this qualitative study were used to inform the content and development of a survey of primary schools, the Quality of School Outdoor Environment Survey (QSOE). In a small pilot study, 68 English primary schools completed the QSOE on-line and data were analysed descriptively to provide a detailed description of provision that these schools were making for children to be active in the outdoor environment. Physical environmental features were found to be numerous and varied across the sample and considerable involvement of adults and children as facilitators of physical activity was reported. Policies to do with equipment availability, safety, weather or accessibility that could play a part in limiting children's scope for physical activity in the school grounds were detailed. The survey format encouraged complete and full responses. However, as there was a low on-line response, it was thought that future versions might be better delivered in alternative formats.

Associations between children's self-rated physical activity and school environmental variables, derived from the earlier stages of the project were then identified through multi-level linear regressions. Where schools trained pupils to be sports' ambassadors and delivered health messages in the curriculum that supported active travel to school, children were more active. Children were less active at schools that provided outdoor clothing and training for outdoor learning.

The findings of these investigations were used to inform a summary checklist for schools comprising potentially important physical, social and policy items relating to school outdoor provision.

PUBLISHED PAPERS

Woolley, K., Edwards, K., and Glazebrook, C. (2018). Focus group or individual interviews for exploring children's health behaviour: the example of physical activity. *Advances in Pediatric Research, 5*, 1-10.

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For my father, Dr. D.L.Woolley

who shared with me his interest and belief in Science

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GLOSSARY OF TERMS

Outdoor environment: refers to any outside spaces whether in the school playground, on the way to or from school or off-site facilities and visits.

School outdoor environment/landscape: refers to actual outdoor spaces or facilities at school (e.g. school playground; field; wild areas; trim trail), the social environment at school within which PA takes place (e.g. adult support for games; peer support programmes) and the wider school-level policies and practices that support children's PA in the outdoor environment (e.g. health education in the curriculum; promotion of active travel)

School environment: refers to all aspects of school provision relating to PA including Physical Education, general curriculum, school grounds, size and location, before and after school activities, promotion of active travel, playground facilities, indoor spaces etc.

LIST OF ABBREVIATIONS

ATS	Active Transport to School
CAST	Children’s Activity Scanning Tool
CRCT	Cluster Randomised Controlled Trial
CT	Controlled Trial
IMD	Index of Multiple Deprivation
KS1	Key Stage 1 (Children aged 5-7)
KS2	Key Stage 2 (Children aged 7-11)
LPA	Light Physical Activity
MVPA	Moderate to Vigorous Physical Activity
NCMP	National Child Measurement Programme
Ofsted	Office for Standards in Education, Children's Services and Skills.
PA	Physical Activity
PE	Physical Education
PAQ	Physical Activity Questionnaire
PHR	Participatory Health Research
RCT	Randomised Controlled Trial
SATs	Standard Attainment Tests
SOCARP	System for Observing Children’s Activity and Relationships during play
SOFIT	System for Observing Fitness Instruction Time
SOOP	System for Observing Outdoor Play
SOPLAY	System for Observing Play and Leisure in Youth
SRTS	Safe Routes to School
TPA	Total Physical Activity
WHO	World Health Organisation
WSB	Walking School Bus

CHAPTER 1

1.1 INTRODUCTION

In this chapter, the global public health challenge of childhood obesity is introduced and physical activity promotion put forward as one means of addressing the issue. Key matters relating to children's physical activity are described and it is established that schools may be important settings for encouraging children to be active. Promoting physical activity in the outdoor environment is shown to be a way forward which might enable schools to balance curricular demands with the need to make provision for children to be active. Methods for evaluating school provision for physical activity in the outdoor environment are discussed and the importance of involving children in research about their own environment is stressed. The mixed methods approach, as adopted in this thesis, is presented before the chapter concludes with the thesis rationale, aims and objectives.

1.2 THE CONTEXT OF CHILDHOOD OBESITY

Childhood obesity has been cited as being one of the most serious global public health challenges of the 21st century (World Health Organisation, WHO, 2004) with obese children and adolescents having an increased risk of developing serious health problems (Smith et al, 2020a), and of becoming obese as adults (Singh et al, 2008). The global trend is for a rising prevalence of childhood obesity (NCD Risk Factor Collaboration, 2017) despite some evidence that levels of childhood obesity may have stopped rising so sharply in some settings (Olds et al, 2011) and in some sub-groups (Jaarsveld and Gulliford, 2015). Across the world, it was estimated that in 2018, 40 million children below the age of 5 and more than 340 million children aged 5-19 years were affected by overweight or obesity (UNICEF, 2019).

UK trends in childhood obesity are monitored by the National Child Measurement Programme (NCMP; Public Health England, 2020) which measures the height and weight each year of children in reception classes (age 4-5) and Year 6 classes (age 10-11) of over 99% of state maintained schools and academies in England. In the school year 2019-2020, NCMP data showed that over a fifth (23%) of reception aged children and over a third

(35.2%) of Year 6 children were overweight or obese (NHS Digital, 2020). Since the first measurements were taken in 2006-2007, there has been an upward trend for obesity and excess weight in Year 6 boys and girls (NHS Digital, 2020).

Physical activity (PA) is thought to be an important factor in the management of childhood obesity (Department of Health and Social Care, DHSC, 2016; Hills et al, 2011,) and evidence suggests that there is a negative association between levels of PA and overweight and obesity in children and adolescents (Ness et al, 2007; Reichert et al, 2009), especially when that activity is more vigorous (Steele et al, 2009). An increase in MVPA of 15 minutes per day at the age of 12 has been found to be associated with lower fat mass in girls (10%) and boys (12%) at the age of 14 (Riddoch et al, 2009). With levels of obesity more than doubling between reception and Year 6 aged children (NHS Digital,2020), it seems that any ways which encourage children to remain active as they move through the school system could have far reaching benefits.

1.3 PHYSICAL ACTIVITY IN CHILDREN

1.3.1 DEFINITION AND INTENSITY OF PHYSICAL ACTIVITY

The World Health Organisation (WHO) defines physical activity as '*any bodily movement produced by skeletal muscles that requires energy expenditure*' (WHO, 2020, p.15). The energy used during any particular activity can be described in terms of its metabolic equivalent (MET) which is the ratio of a person's metabolic rate when engaged in any particular activity to a resting rate when sitting quietly. One MET is equivalent to expending 1 kcal/kg/hour (Ainsworth et al, 2011). An activity rated as 4 METS is one which expends four times as much energy as that needed for a person at rest.

Guidelines written by the United States Department of Health and Human Services, (DHSS, 2018) set out levels for different intensities of activity with Light intensity PA (LPA) being defined as being between 1.6 METS to 2.9 METS, Moderate intensity Activity between 3.0 and 5.9 METS and Vigorous intensity activities above 6.0 METS. Moderate intensity exercise accelerates the heart rate and involves a certain amount of effort whilst vigorous intensity activity involves considerable effort and speeds up breathing and heart rate substantially (DHSC, 2019). Riding a scooter, playing in the school playground or rollerblading are classed as moderate intensity activities for children (NHS, 2019).

1.3.2 THE BENEFITS OF PHYSICAL ACTIVITY IN CHILDREN

As well as contributing to the prevention of overweight and obesity, regular PA promotes enhanced health in children. Some of its benefits include improved skeletal and cardio-metabolic health and better cardiorespiratory and muscular fitness (British Heart Foundation, 2014; Chalkley et al, 2015; Ekelund et al, 2012; Janssen and LeBlanc, 2010; Physical Activity Guidelines Advisory Committee, 2018). PA may also play a part in reducing mental health problems (Ahn and Fedewa, 2011, Chalkley et al, 2015) and helping children to develop successful social skills (British Heart Foundation, 2014; Chalkley et al, 2015). Furthermore, a dose-response relationship has also been demonstrated between Moderate to Vigorous intensity PA (MVPA) and a number of health outcomes such as aerobic fitness (Nevill et al, 2020), the likelihood of having high risk HDL cholesterol values (LeBlanc and Janssen, 2010) and health-related Quality of Life (Wu et al, 2017) and there is strong evidence that even as little as two or three hours of MVPA in a week can be associated with positive health outcomes (Janssen and LeBlanc, 2010).

Academic achievement may also be enhanced through PA (Booth et al, 2014; Chalkley et al, 2015) and, at the very least, increasing time for PA in the school day does not appear to impact negatively on academic outcomes even when curricular time is reduced (Trudeau and Shepard, 2008). Young people who are physically active report significantly better health-related quality of life compared with those who are more sedentary (Gopinath, 2012) and being regularly active as a child has been shown to predict PA and well-being in adulthood (Dohle and Wansink, 2013; Telama, 2009; Telama et al, 2014) especially for boys (Telama et al, 2005).

1.3.3 INFLUENCES ON CHILDREN'S PHYSICAL ACTIVITY

Physical activity is a complex health behaviour which is determined by a wide range of demographic and biological, psychological, behavioural, social/cultural and environmental factors (National Institute for Health and Care Excellence (NICE), 2007; Sterdt et al, 2014). Ecological models such as ecological systems theory (Bronfenbrenner, 1994) can be used as frameworks for understanding the interplay between various levels of influences on an individual. In these models, it is proposed that health behaviours are established and perpetuated in a system which involves a web of individual, socio-cultural, policy and environmental factors.

At the heart of the system is the individual, with his/her own attitudes, beliefs and knowledge who interacts with those in the immediate environment such as the family or caregivers, school or day-care, where formal and informal rules regarding health behaviours are determined. These are, in turn, part of the wider society which establishes norms and expectations, provides resources and creates laws, customs and policies. Social interactions are embedded in a physical context which itself may support or discourage certain behaviours. Physical activity is dependent upon the complex interplay between the various levels of influence (Davison and Birch, 2001; Sallis et al, 2015; Salmon and King, 2010).

Although the variety of ecological models vary in the way that levels of influence on an individual are described (Sallis et al, 2015) they share some core principles, one being that *'there are multiple influences on specific health behaviors, including factors at the intrapersonal, interpersonal, organizational, community, and public policy levels' (Sallis et al, 2015).* Furthermore, these factors operate together to determine a health behaviour which suggests that in order to change that behaviour, multi-strand interventions are likely to be most effective (Sallis et al, 2015; Stokols, 1992). Simply educating individuals about the detrimental implications of an inactive lifestyle is unlikely to determine positive health behaviours if the physical, social and policy environments they live, work and play in do not support them.

As well as being multi-faceted in terms of their physical, social and policy components, these complex environments can be further understood by considering their objective or subjective qualities and whether their influences are proximal or distal to the individual (Stokols, 1992). Specific environments can be conceived of as being part of much larger systems where local settings such as schools, homes and work-places are influenced by factors further removed from those immediate environments (Stokols, 1992). School-level decisions about children's PA promotion, for example, could be affected by parental views, county-level budget allocation or national curriculum regulations. A socio-ecological approach to understanding children's PA participation stresses the importance of inter-connections between individuals and their physical, social and policy environments (Sallis et al, 1988). In order to understand school promotion of children's PA, therefore, the contribution of multiple factors needs to be considered; individual characteristics of a child such as their gender, age and preferences, physical environmental features such as equipment and spaces, social environmental factors such as teacher and peer encouragement and policies such as access to facilities, lengths of breaks or activity bans.

Schools are inextricably embedded in larger, complex systems involving families and community networks which need to play their part in supporting school efforts to encourage children to be more active. Comprehensive or Whole-School models have been increasingly advocated as school approaches that incorporate opportunities for children to be active throughout the day, focus on the creation of supportive environments and which recognise the role of external partners (Carson et al, 2014; Daly-Smith et al, 2020; IOM, 2013; Public Health England, 2020a). Whole-School approaches posit that educational activities alone such as through the PE curriculum will not be sufficient for schools to increase children's PA and it is thought that opportunities for PA need to be built in to and encouraged throughout the whole school day, before, during and after school hours.

One such Comprehensive School Physical Activity Programme, for example, includes 5 main facets; classroom activity breaks, sporting events within and beyond the school, break times between lessons, before and after school activities and active transport to school (ATS; IOM, 2013). Another example of a whole school policy (Victoria State Government, 2021) suggests that quality PE, quality school sport, active classrooms, ATS, active recreation and supportive school environments should form the foundation of an active school framework. In the UK, the delivery of multi-component interventions in a school setting is proposed as an overarching principle of a whole-school approach (Public Health England, 2020a). Through these, children can be given opportunities to learn about health benefits of PA and to take part in PA through different subjects of the curriculum as well as being supported by a PA-friendly school culture and physical environment. In addition, it is suggested that partnerships with families and the wider community need to be part of a comprehensive school approach.

At the individual level, gender and age have been found to be factors which contribute to children's participation in PA. It is a common finding across the literature, for example, that boys tend to be more active and less sedentary during childhood than girls (Cooper et al, 2015). Activity patterns vary according to intensity with girls sometimes demonstrating more LPA than boys (Baquet et al, 2007) and boys engaging in more MVPA and/or VPA than girls (Stratton and Mullan, 2005, Baquet et al, 2007, Ridgers et al, 2007a, Dudley et al, 2018b, McWhannel et al, 2019). However, in other studies, no differences have been found between girls and boys in MVPA and VPA (Ridgers et al, (2007b) and boys have been found to be more active only in certain age groups (Escalante et al, 2014a). Age-related declines in PA are also a typical pattern in National Data (Dentro et al, 2014; Standage et al, 2014) and are reflected in studies of children's PA at school. Elder et al (2011), for example, observed a decrease in MVPA and walking over the course of a year in boys and girls and Ridgers et al (2012a) found decreases in children's break-time MVPA over 5 years, with a greater decline during the transition from primary to secondary school.

Whilst some research has found these reductions in children's PA from about 10 years old to early adolescence (Corder et al, 2015; Nader et al, 2008; NICE, 2007; Pate et al, 2019) and consistently over the adolescent years (Dumith et al, 2011), other researchers have found that levels of PA are declining much earlier (Cooper et al, 2015; Farooq et al, 2018; Jago et al, 2017; Ridgers et al, 2012a), starting in children as young as 5 (Cooper et al, 2015; Kwon et al, 2015) or 7 (Farooq et al, 2018) years old. Jago et al (2017) reported a decrease in MVPA of 3 minutes per day in boys and 7 minutes per day in girls between Year 1 (age 5-6 years) and Year 4 (Age 8-9 years) in a sample of over 1000 children and over a four year transition period from primary age to secondary (9-10 years to 13-14 years), longitudinal data have shown that 40 daily minutes of PA are replaced by sedentary behaviours (Corder et al, 2015).

Differences in the socio-economic environment, (Baquet et al, 2014; McWhannell et al, 2019; Scholes, 2016), nationality (Cooper et al, 2015) and ethnicity (Sport England, 2019) may also play a part in determining children's PA behaviours and numerous other personal and environmental features have been found to have positive associations with PA such as self-efficacy, (Van der Horst et al, 2007), weight status (Cooper et al, 2015), the length of time spent outdoors (Sterdt et al, 2013) or access to programmes and facilities and to safe walking or cycling routes to school (British Heart Foundation, 2014).

1.3.4 MEASUREMENT OF PHYSICAL ACTIVITY IN CHILDREN

In the study of children's PA the focus and limits of the research project, facets of the environment and age of the participants need to be taken into consideration when choosing a method for estimating children's PA levels. A range of instruments and methods exist including self-report, direct observation, objective measurement devices, doubly labelled water or indirect calorimetry (Corder et al, 2008; De Vries et al, 2004; Loprinzi and Cardinal, 2011; Sirard and Pate, 2001; Trost, 2007). Measures vary substantially in how well they reflect the true amount of PA that is being displayed and in their suitability for different situations, an observation described by Welk et al (2017) as a feasibility/validity continuum. While some measures, such as self-reports are cost and time effective, for example, they might lack high validity and others, such as doubly labelled water, which are highly valid, may be too expensive and unwieldy to use in an everyday setting such as a school.

Children's distinct, more intermittent pattern of PA compared with adults and cognitive skills which are not so highly developed (Welk et al, 2000; Welk et al, 2017) need to be taken into consideration when choosing a method for measuring PA as well as the specific type of activity. Some self-report measures, for example, are not suitable for children under 10 years of age (De Vries et al, 2004; Sirard and Pate, 2001; Trost, 2007) as children may not remember the numerous occasions during a day when they engage in short bursts of PA in between other events and due to the way in which accelerometers measure vertical movements of the trunk of the body, some activities such as cycling, climbing stairs or carrying objects may not be detected (Børrestad et al, 2013; Cooper et al, 2006; Trost, 2007). Pedometers have been found to be less accurate when used to register LPA (Clemes and Biddle, 2013; Duncan et al, 2007; McNamara et al, 2010).

1.3.5 GUIDELINES FOR PHYSICAL ACTIVITY

The World Health Organisation recommends that children and adolescents between the ages of 5 and 17 should engage in at least 60 minutes of MVPA on average each day. This PA needs to be mainly aerobic, incorporating activities which strengthen muscle and bone at least 3 times per week (WHO, 2020). UK Government advice echoes these recommendations and specifies that '...*this can include all forms of activity such as physical education, active travel, after-school activities, play and sports'* (DHSC, 2019: P24).

1.3.5.1 PROPORTIONS OF CHILDREN MEETING GUIDELINES

Despite the numerous potential health, social and educational benefits of PA in children, data from the 2018-2019 Sport England survey (Sport England, 2019) indicated that fewer than half (46.8%) of English children aged 5-16 were active, on average, for at least an hour each day, whilst 29% of children and young people were reported to be taking part in sport and PA for less than an average of 30 minutes daily. Globally, too, the proportion of young people meeting WHO guidelines for PA is notably low. In a study which analysed data from 1.6 million adolescents aged 11-17 across 146 countries who completed a variety of school-based surveys (Guthold et al, 2020), only 19% respondents overall were found to be sufficiently active each day.

In addition, data from the Health Behaviour in School-Aged Children survey which provides international data about health behaviours (Inchley et al, 2020) showed that internationally, fewer than half of children aged 11, 13 or 15 participated in sufficient PA during 2017-2018, with only 19% engaging in recommended daily amounts. The proportions of children reporting at least one hour of MVPA each day varied between countries and had declined in a third of the countries surveyed since 2014. Proportions of 11 year old girls reporting at least one hour of MVPA each day ranged from 7%-38% across 45 countries with levels in the UK being measured as 18% (England), 19% (Wales) and 20% (Scotland). For 11 year old boys, the range was 13%-52% with values for the UK being 22% (England), 31% (Wales) and 22% (Scotland). Reported levels of MVPA were higher for boys in most countries (Inchley et al, 2020). A further study amalgamating accelerometer data from 10 studies across 8 countries found that only 9% of boys and 1.9% of girls between the ages of 5 and 17 years old achieved the international guidelines of 60 minutes of MVPA per day (Cooper et al, 2015). The authors reported also that the international guidelines were achieved on nearly half (46%) of days by boys and on 22% days by girls.

Although there has been an increase in the number of countries monitoring prevalence of PA since 2012, there is little evidence that the prevalence of physically active children is increasing (Sallis et al, 2016). Rather, levels of PA and active play in children across the world are low, on average, even where environmental and policy support has been introduced or even rated highly such as for strategies implemented by the Danish government to promote youth activity or investments in infrastructure made in the Netherlands (Tremblay et al, 2016). Out of 49 countries which reported on children's overall PA levels in the ‘Global matrix’, an initiative through which countries collate information and report on 10 common indicators relating to PA, Slovenia reported the highest 'grade' (Aubert et al, 2018). Schools in Slovenia are thought to play an important part in helping young people to reach this goal through physical education (PE) for all and a widespread programme offering extracurricular PA options and sporting events (Sember et al, 2018).

1.4 SCHOOL AS A SETTING FOR PROMOTING PHYSICAL ACTIVITY

Schools have been identified as key settings for promoting PA (Centers for Disease Control and Prevention (CDC, 2019; Clarke et al, 2013; Gately et al, 2013; Naylor and McKay, 2009; Pate et al, 2006; Story et al, 2009) as they are in a position of being able to offer health education to a wide population of young people from all walks of life and a variety of environments and activities in which they can be active. Schools are places where the social, physical and policy environment might potentially influence PA and corresponding health status of their students. Life-long health-habits can be formed at an early age in the school setting (CDC, 2019; DHSC, 2018; NICE, 2006; Pate et al, 2006; United Nations, 2020). There is clearly scope within the school setting to promote PA through policy decisions and creating supportive environments. Despite this potential for schools to offer extensive provision for encouraging young people to be active, however, what they can actually provide may be limited by internal and external constraints.

In the UK, for example, PE is a compulsory subject in the National Curriculum (Foster and Roberts, 2019) and Ofsted (Office for Standards in Education) have recommended that primary schools spend at least two hours each week on core PE. Raising the profile and practice of PE in primary schools which are not meeting advised standards, however, may be hampered by a number of barriers such as a lack of staff expertise, unwillingness by senior managers to prioritise PE, competition with literacy and numeracy and a lack of physical space (Callanan et al, 2015). Furthermore, in a climate where school staff may feel judged more on the academic achievement of their pupils rather than on their physical health, taking even small chunks of time out of the school day for children to be active might feel too pressurising for teachers (Gately et al, 2013). While short, classroom-based activity breaks can offer opportunities for children to acquire valuable PA minutes and to minimise extended periods of being sedentary (Active Living Research, 2013), teachers have described how fitting in ten minutes of PA is sometimes impossible in an already overloaded curriculum (Gately et al, 2013). In addition, large classes and small spaces create difficulties with implementing these kinds of programme and some teachers believe that due to sufficient opportunity already for PA in the school, they are not necessary (Gately et al, 2013).

Nonetheless, in the UK, schools are viewed as crucial settings for shaping children's health habits (DHSC, 2016) and, as part of the government’s plan to tackle childhood obesity, have directed that schools must deliver at least 30 minutes of the recommended 60 daily minutes of MVPA for primary aged children through *'…active break times, PE, extra-curricular clubs, active lessons, or other sport and physical activity events… (DHSC, 2016; P7)'.* In a recent survey, 40% of English children were reported to achieve this target (Sport England, 2019).

1.4.1 SCHOOL-BASED INTERVENTIONS INVOLVING PHYSICAL ACTIVITY

Given the importance of PA as a health behaviour and the suitability and reach of the school environment, it is not surprising that schools have been reported to be a predominant setting through which interventions to promote PA have been delivered (Salmon et al, 2007). Table 1.1 shows a summary of 10 systematic reviews and 1 review of reviews in which authors have evaluated the evidence supporting school-based interventions for promoting children's PA. Varying conclusions have been drawn about the effectiveness of these school-based interventions, with most reviewers rating the evidence as being limited, inconclusive or insufficient due to variable methodological quality of many studies in this field. As most of the reviews combined data for children and adolescents, it is difficult to assess the impact of interventions in primary aged children alone. Reviews focussing solely on or presenting separate data for primary aged children have shown that, although there are some inconclusive findings (eg. Nally et al, 2021) school-based interventions for children of this age can have positive effects on children's PA (Demetriou and Honer, 2012; Jones et al, 2020; Van Sluijs et al, 2007). In Kriemler et al's review (2011), too, the 2 randomised controlled trials (RCTs) offering the highest level of evidence were conducted with primary school children and contributed to the overall level of evidence for school-based interventions being rated as 'strong.' It can be seen that there is potential for primary schools to make a difference to children's activity levels and a need to determine where school efforts might be best placed.

However, even where school-based interventions are successful, some authors have concluded that daily MVPA is only negligibly altered. Metcalf et al (2012), in a systematic review of 30 RCTs and clinical CTs of studies designed to increase whole day PA of young people ≤16 years across all settings, with over half of the included studies based in schools, found increases of approximately 4 minutes per day of walking or running as a result of interventions. The authors speculated that extra intervention-specific PA might replace other times when children are active in the day/week and so overall daily/weekly PA amounts remain unchanged. Frémeaux et al, (2011) proposed that a biological mechanism to control PA is in operation, rather than environmental regulation and hypothesized that engaging in more exercise at one time would result in reduced activity at another. Objective

PA measurements at three schools in their study showed that, although differences in PA were found between the schools for in-school activity, overall PA across a week did not differ between the schools.

1.4.2 VARIATION IN PHYSICAL ACTIVITY BETWEEN SCHOOLS

Significant variation in primary school children's PA levels has been found between schools (Faulkner et al, 2014; Gomes et al, 2014; Griew et al, 2010; Kristensen et al, 2013; Martin et al, 2012; Parrish et al, 2009a; Pereira et al, 2020) with proportions of children who were moderately or highly active ranging, for example from 40%-70% across 13 Australian schools (Parrish et al, 2009a). Estimates of the proportion of variance in primary aged children's PA that can be explained by school-level attributes, differ considerably between studies and range from values as high as 36% (Gomes et al, 2014) and 18.2% (Pereira et al, 2020) in Portuguese schools, 14.5% (Griew et al, 2010) and 14-16% (Salway et al, 2019) in UK schools to 3% in a Canadian study (Naylor et al, 2008). An analysis of sources of variability in obesity related variables across 12 countries (Katzmarzyk et al, 2018) further illustrated these differences with percentage of school level variance in MVPA reported as being 49.9% at the Kenyan study site, for example, 13.8% in the UK and 5.7% in Canada. These differences suggest that there could be factors to do with the school environment which might have some influence on children's PA and a clearer idea of the reasons for this variation between schools would be one way to inform the development of new approaches aiming to promote PA and reduce childhood obesity.

1st Study author, date *meta-analysis	Age of school children (years)	Types of trial/reviews included	Number of studies (or reviews) reporting PA outcome	Results Most Successful intervention strategies	Evidence for effectiveness of school-based interventions for promoting PA: Authors' conclusions
Van Sluijs, 2007	<12	Any intervention	27	13 studies based in school setting alone 5 RCTs of which 3 reported positive intervention effects. 14 studies incorporated family or community elements.	Inconclusive
Kriemler, 2011	6-18	CT RCT ≥3 months	16	All interventions shown to have positive effect on at least 1 PA outcome. Strongest evidence from 2 RCTs which used daily PE lessons with PA breaks and PA homework, behavioural modification strategies and/or fundamental motor skills, PE specialists and family support.	Strong
Demetriou and Honer, 2012	6-12	CT RCT	51	58.8% studies showed positive, 5.9% showed negative and 35.3% showed no effect of school-based interventions. PA+cognitive component and components targeting PA only found to be important strategies	Small to medium effects at best
Dobbins, 2013	6-18	RCT ≥3 months	5	40% studies showed positive effect on PA. Curriculum changes, printed education materials, longer time for MVPA, audio-visual materials, community-based strategies, games equipment, PE teachers and research staff to implement strategies found to be successful.	Limited evidence for small to moderate impact
Russ, 2015*	5-18	All Interventions	14	Meta-analysis showed small overall effect of comprehensive school PA programmes on children's daily PA. Slightly larger effects where schools implemented more components specifically involving increased PA opportunities during, before and after school. Smaller effect sizes found in studies that utilised objective measures of PA compared with self-report.	Limited evidence for impact of multi-component interventions

1st Study author, date *meta-analysis	Age of school children (years)	Types of trial/reviews included	Number of studies (or reviews) reporting PA outcome	Results Most Successful intervention strategies	Evidence for effectiveness of school-based interventions for promoting PA: Authors' conclusions
McDonald, 2018	3-18	CT	32	38% studies showed positive effect on PA. 75% studies in active transport settings had positive effect on PA and 67% in classroom break interventions. PE, recess and after-school interventions less effective.	Inconclusive based on quality of evidence Only 17% of studies across all settings were rated as high quality
Messing, 2019 Systematic review of reviews across settings		2 reviews of reviews, 25 systematic reviews (3 with meta-analysis), 1 review	(28)	PE lesson quantity and quality, integration of more PA into curriculum,activity breaks, after school programmes, school environment changes, parental involvement, active transport promotion, interventions focusing on PA only thought to be important strategies.	Strong
Love, 2019*	6-18	Cluster RCT, ≥ 4 weeks	17	Meta-analysis showed no pooled effect of interventions	No effect
Jones, 2020*	5-11	29 RCT 17 CT 10 Descriptive 1 mixed methods ≥ 4 weeks	57	68% studies showed positive effect on MVPA Meta-analysis showed moderate effect size for sub-set of 11 studies which measured MVPA objectively across whole day. Over 82% studies which reported expanded opportunities for PA, such as class PA breaks, physically active learning/homework, before/after school clubs and active travel showed positive effects on children's PA.	No overall evidence for effect on MVPA due to quality of evidence
Dabravolskaj, 2020*	4-18	Comparative studies ≥ 6 months	83 representing varied outcome measures	Comprehensive School health interventions showed positive effect on step-count per day in 1/5 studies. 1 other study showed increased step count in boys and increased MVPA in girls. Interventions Promoting PA outside PE classes showed positive effect in 1 study of 6, negative effects in another and long term positive effects in a third. 4 of 12 multicomponent studies showed positive effects.	Meta-analysis showed significant effect only for comprehensive school health.
Nally, 2021*	5-12	RCT Cluster RCT≥12 weeks	18 in meta-analysis	Meta-analysis showed small increases in MVPA in control groups after interventions.	Inconclusive

Table 1.1 Summary of reviews evaluating evidence for school-based interventions

1.4.3 FACTORS INFLUENCING CHILDREN'S PHYSICAL ACTIVITY IN SCHOOLS

Some studies have sought to explain this school level variation by exploring multiple explanatory variables. One large Portuguese study, found that just over one third of the variability in children's PA could be explained by the school context with school size, school setting, playground area, frequency and duration of PE and qualification of PE teacher explaining most of that variability (Gomes et al, 2014). As the PA measure was a 7-day recall questionnaire, however, children might have over or under reported their PA as they might not easily remember their PA behaviours across a whole week, potentially reducing the accuracy of the PA data.

A further Australian study specifically explored associates of recess PA (Martin et al, 2012) and were able to explain 40% of the school level variance. Children were more active at break times if their school was newer, had grassy areas, especially those which were unshaded, employed a PE coordinator who met National standards and where their class teacher had not attended recent professional development training for PE. Strengths of this research included the stringent development and use of objective measures for the school environment, related to the PA being measured, objective measurement of PA by accelerometer and 87.4% participation rate.

In the UK, a small number of studies have investigated the relationship between school variables and pupils' PA and identified only a few of many potential school level correlates to be associated with school-based time in PA (Taylor et al, 2017; Van Sluijs et al, 2011), or 1 year changes in children's PA (Mantjes et al, 2012). Taylor et al (2017), for example, found only playground area to be associated with children's MVPA in a sample of 7 Lancashire schools. Other variables such as having 'lollipop' provision and good walking access were reported to be features of schools where children were more moderately active in the 'Speedy' study in Norfolk (Van Sluijs et al, 2011) and where schools gave pedestrian training and had good sports' facilities, children took part in more VPA. Longer morning breaks and safe crossings near a school were also features found to be positively associated with 1-year changes in MVPA in 'Speedy' schools whereas negative associations were found with changes in children's PA if a school had changing facilities, provided play and sports equipment or delivered health promotion information (Mantjes et al, 2012). Some strengths of work undertaken within the 'Speedy' project include large sample sizes, purposive sampling, a validated audit for measuring aspects of the school environment (Jones et al, 2010) and objective measurement of PA through the use of accelerometers.

1.5 SCHOOL PROMOTION OF PHYSICAL ACTIVITY IN THE OUTDOOR ENVIRONMENT

As seen above (section 1.4), with regard to active pursuits, schools may not be able to provide the time or opportunities for the amount of MVPA in the curriculum that may be required to address general health and body weight maintenance or reduction. Utilising the whole school environment, in addition to and during formal lesson provision, might offer further possibilities for PA, during breaks, before and after school clubs, environmental education lessons or adapted areas of the school. Some variation between schools can be explained by aspects of their outdoor provision. The school's outdoor landscape may be an important environment for activity promotion and obesity prevention efforts.

There is developing interest in the link between the outdoor environment and health and some evidence that being outside in itself might encourage higher levels of PA (Biddle et al, 2011a; Cleland et al, 2008; Cooper et al, 2010; Gleave and Cole-Hamilton, 2012; Gray et al, 2015; Mackett et al, 2005; Mackett et al, 2007; Munoz, 2009; Stone and Faulkner, 2014; Tremblay et al, 2015; Coen et al, 2019) and that education in the outdoor environment is associated with increased light to moderate PA in students (Romar et al, 2019). School breaks have been shown to be times when children engage in more intense bursts of exercise and accrue proportionally more of their daily requirement of MVPA than during other segments of a school day (Dessing et al, 2013) and have higher levels of PA than in PE lessons (Gao et al, 2017). It is reported that children can accumulate up to 40% in boys and 30% in girls of the recommended levels of MVPA during school playtimes (Ridgers et al, 2006). Massey et al (2018) found that approximately 27% of the total number of steps taken at school came from breaks despite the fact that recess only occupied just under 6% of the school day in their study.

A meta-analysis of 16 primary school-based trials showed that there is some evidence that recess-based interventions are effective for increasing children's PA (Parrish et al, 2020). In their narrative review, however, Parrish et al (2020) found that study effects were inconsistent, although provision of loose equipment and natural environments had mainly positive effects on children's PA. Other reviews focussing on studies conducted specifically during recess periods have found beneficial effects of many break-time strategies such as the use of playground markings, provision of equipment or greater length for playtimes on children's PA (Sánchez and Gallego, 2021; Suga et al, 2021).

1.5.1 PHYSICAL ACTIVITY THROUGH PLAY IN THE SCHOOL OUTDOOR ENVIRONMENT

Active Play and Informal activity have been found to be the most common form of PA for children aged 7-11 (Sport England, 2019) with play and unstructured activities being associated with higher levels of daily PA (Brockman et al, 2010) and allowing more calorie consumption than equivalent structured events (Janssen, 2014; Mackett and Paskins, 2008). Furthermore, informal exercise in the form of active play and walking have been found to be types of PA which contribute most to a daily 'dose' in children who meet government recommendations for physical exercise, especially in younger children (Payne et al, 2013). Children have reported that the outdoor space at school is their 'favourite place' where they can have fun (Darmody et al, 2010) and enjoy themselves (Snow et al, 2019). Children look forward to their 'playtimes' and naturally interact with their playground environments in imaginative and spontaneous ways (Thomson, 2007). Children's play is thought to be innately driven (Crain, 2010; Skills Active, 2008) and schools are well placed to offer opportunities for encouraging this natural behaviour in their outdoor spaces.

There is considerable debate about the nature of play and what it is for (Lester and Russell, 2008) and in the context of the school outdoor environment, the way in which it is conceptualised is likely to play a part in determining how children interact with their space. A view of play as unstructured and self-determined is put forward in the 'Playwork Principles' (Skills Active, 2008) and Lester and Russell (2008) note that some element of personal choice and control are consistent themes across the literature for characterising play. Primary school pupils have also identified that having free time for doing what they want is an element of school playtimes that they particularly like (Baines and Blatchford, 2019). However, with freedom to choose, some play may lead to more negative outcomes such as social exclusion, abuse of power and behaviours which contravene socially accepted, adult agreed norms (Meire, 2007). This can create a tension for educators who need to consider the organisation and safety of children during their break times at school as well as for children who do not enjoy the poor behaviour of a small number of others (Baines and Blatchford, 2019).

Children's play may also be subsumed within broader goals such as obesity prevention strategies and other health-related goals, thus neglected and sidelined as an essential and unique childhood behaviour (Alexander et al, 2014; Alexander et al, 2015). A conception of play as solely one of opportunities to be active misses the wider construction of play as being for fun, to regulate emotion, for relaxation, to be imaginative and creative or for social interaction (Alexander et al, 2014; Alexander et al, 2015). Sedentary play may incorporate a plethora of advantages and does not, necessarily prevent children from engaging in more active pursuits at another time (Alexander et al, 2014, Alexander et al, 2015).

Whilst schools, therefore, are recognised as being vital places for providing opportunities for children to be active, there has been considerable debate about how this might be achieved during break periods. Benefits of planned, highly supervised opportunities for increasing PA for all children (Robert Wood Johnson Foundation, 2007) are put forward on the one hand, set against arguments that schools also need to provide time and space for children to engage in play of their own choice (Play England, 2009). Free, unstructured play, where children are given opportunities to explore and make sense of the world in a way that they choose, with no external, adult-set agenda is likely to enhance social and cognitive skills (Gleave and Cole-Hamilton, 2012; Murray et al, 2013; Pellegrini, 2008) as well as being '*essential for healthy physical and emotional growth*' (Play England, 2009, p.2). Providing chances for children to be active and to be involved in free play may often go hand in hand as when recycled, movable objects were provided in one intervention study, resulting in more pupils being more vigorously active as well as promoting excitement, problem solving, social skills and creativity within the context of free play (Hyndman et al, 2014b).

1.5.2 EVALUATING SCHOOL PROVISION FOR PA IN THE OUTDOOR ENVIRONMENT

With the potential for schools to create outdoor spaces and instigate policies which support children's PA in the outdoor environment, it is important to ascertain what schools are already providing in the way of physical resources, social support and policy implementation. Reliable and valid tools are needed for accurate evaluation of the impact of initiatives undertaken in the school outdoor environment and for studying differences in provision between schools and how that relates to children's PA. It has been suggested that in the study of environmental correlates of PA, it is important that the environmental variables chosen for study are specific to the behaviour that is being measured as people are likely to behave in different ways in different settings (Giles-Corti et al, 2005). Where PA related to the school setting is being studied, therefore, specific aspects of the school environment where that behaviour is being measured need to be included in studies which seek to determine the association between school factors and PA during the school day.

Some broad scale questionnaires have been devised to assess and describe the primary school outdoor PA environment. Chancellor (2013), for example, aimed to investigate physical features of school playgrounds through a 43 item online survey in a large sample of Australian primary schools and how school policies impacted on school provision for PA. Another 47 item survey was posted to all Scottish schools, with a view to learning about the character of school grounds, how they were used and the challenges associated with their use (McKendrick, 2005). Repeat surveys, completed online or via hard copy, have also been used to monitor and describe patterns in overweight and obesity and related behaviours over time in Australian schools (Hardy et al, 2010; 2016) and for understanding the practical and social features associated with English school break times (Blatchford and Baines, 2006, Baines and Blatchford, 2019).

Short questionnaires about specific aspects of school provision have also been developed (Gomes et al, 2014; Haug et al, 2010; Nielsen et al, 2010; Taylor et al, 2017). Haug et al, (2010) collected information from head teachers about the existence and availability of only 8 specific physical outdoor facilities such as a ‘soccer field’ or ‘areas for hopscotch marks’ in order to make an assessment of the school PA environment. Whilst the authors noted the problem of subjectivity in their questionnaire and raised the possibility that respondents might have viewed facilities in different ways, it is feasible that the small number of easily identifiable features would have been observed reasonably accurately, thus enhancing reliability. However, in delineating the school landscape in this narrow way, other facets of the school environment that could be important for encouraging children to be active could also be missed, thus bringing into question the validity of the instrument for accurate assessment of the school environment.

Systematic observational audits have been found to be reliable tools for collecting information about school physical landscape features (Broyles et al, 2015; Harrison et al, 2016; Jones et al, 2010). These have involved the use of comprehensive user manuals, training of auditors and a requirement for auditors to visit each site, thus placing a substantial time and cost burden on the research project. A broad audit of the school's physical landscape (Jones et al, 2010), incorporating questions about provision for active transport, sports and play facilities, aesthetics and perceived suitability of the school grounds for PA was found to be a reliable tool for assessing school PA environments.

Construct validity was also demonstrated for some components of the audit which were able to demonstrate higher levels of PA in schools which had higher environmental scores. Broyles et al (2015), in an audit based on that of Jones et al (2010), reported an inter-rater percentage agreement ranging from from 83.9% to 100% across 98% of the items. The one item which was not as reliably assessed, 'suitability of school grounds for play' could be considered to be more subjective in nature and similar subjective questions involving Likert-style responses or counts, where the items under scrutiny were perhaps not all clearly visible, or required an opinion about design or aesthetics were also the types of item found by Jones et al to be less reliable.

A wider assessment of school outdoor features was made by Van Sluijs et al (2011) who, in addition to using Jones et al's (2010) audit, gathered information about extracurricular activities, weather policies, time allocated for breaks and health promotion amongst other questions. These extra features were self-reported and un-validated by researcher observation. Cardon et al (2012) were also interested in how multiple physical, social and policy factors related to school implementation of policy relating to PA. Face validity of the measure was tested by school principals and teachers for comprehension and completeness. Many of their 41 items, including those about the presence of sports' fields, organisation of after-school clubs and encouragement of PA by adults during break times showed moderate to perfect reliability when a second school representative completed the questionnaire one week after the first.

In other questionnaire studies too, good test-retest reliability has been demonstrated. Lounsbery et al (2013), for example, sought to obtain information about individual school-level policies relating to children's PA. They found that most of their 96 items showed moderate to near perfect reliability when completed by the same respondents twice with a 2 week interval. Nathan et al (2013) also investigated the validity of a School Environment Assessment Tool, for which respondents were asked to indicate availability of facilities and opportunities for PA by comparing the results from a telephone based survey completed by head-teachers with direct observation of survey features by pre-service teachers based at the schools under investigation. For over 50% survey items, head-teachers and pre-service teachers had moderate to near perfect agreement with higher level agreement being found for items assessing PA facilities and organised activities.

Although there might be some uncertainty about the reliability of responses to some questions in these types of questionnaires and surveys, and their validity for measuring aspects of the school environment, they offer a way to collect data through diverse means of distribution and with no need for extensive training or high research costs. This makes them useful tools for exploratory work. In addition, they give an alternative to interviews or observation for obtaining information about social and personal aspects which might have an impact on children's outdoor play. However, measures of the school outdoor environment which have been used in the work cited above, also have a number of limitations which are discussed further in Chapter 5 (Section 5.2). In short, some of these measures assess only a limited range of school factors (e.g. Haug et al, 2010), require lengthy training procedures (e.g. Broyles et al, 2015) or have been developed for use in locations other than the UK (e.g. Cardon et al, 2012).

In addition, definitive features of the school outdoorenvironment which are assessed using environmental measures have been determined predominantly on the basis of previous research and adult, expert advice and it appears that, although children's voices might have been taken into consideration through the literature base, children themselves have rarely been consulted as experts during the process of creating evaluative tools. Their unique perspectives could aid in the construction of school environment measures that more accurately define the context for PA behaviours, thus increasing their validity.

1.6 INVOLVEMENT OF CHILDREN IN RESEARCH ABOUT PHYSICAL ACTIVITY

In order to more fully comprehend the influences which affect children's PA during the school day, research which seeks to understand the experience and views of those who work and learn in schools is needed. Children themselves could, potentially, help to explain what facilitates their PA when they are playing or working outside at school and what barriers prevent them from being active. As participants in society and in research however, children have not always been thought of as credible contributors (Clark, 2011). Viewed as lacking in competence (Le Borgne and Tisdall, 2018; Powell and Smith, 2009) and as incomplete 'human becomings' (Huang, 2019) who are vulnerable and in need of protection (Miller, 2000; Powell and Smith, 2009), children have been involved in research as passive bodies to be studied rather than as active participants who have valid experiences and views (Woodhead and Faulkner, 2000). With developing recognition of children's rights as human beings and their competence to contribute to society, children's voices are increasingly being acknowledged as credible and important. Through international agreement and academic debate, children's right to and ability to take part in research have been highlighted and, to some extent, embraced (Aldridge, 2017; Johnson et al, 2014; Tisdall, 2018).

Specifically, The United Nations Convention on the Rights of the Child (UNICEF, 1989) set out that children who are capable of forming their own views should have *'…the right to express those views freely in all matters affecting the child,' (Article 12, P5)* thus providing clear guidance that children can and should be given the opportunity to contribute their ideas to society and to have those ideas taken seriously. Against this backdrop, there has been a movement towards seeing children as a diverse group of active participants in their social world who are capable of providing information and insight of value to the research process (Brady et al, 2015; Shaw et al, 2011).

The extent to which children participate in a research context varies from being involved as research participants during the data collection process to assuming roles as active partners with adults in the decision-making about the research process itself (Hart, 1992; Lansdown et al, 2005; Shaw et al, 2011; Shier, 2001). Lansdown (2005) describes 3 different levels of participation, the first being consultation, through which children are invited to speak about their views and experiences with the acknowledgement that adults need their additional expertise for developing policies and practices that are relevant to children. Being consulted in this way is adult initiated and managed, with no scope for children to influence the course of a project although it enables a child's perspective to be incorporated into '*otherwise adult dominated agendas*' (Lansdown, 2005). A second level is described as participatory process which gives children the chance to be actively involved in a project. Whilst being adult initiated, children can shape a project by, for example, identifying relevant questions or interpreting the findings. At the third level, children determine the agenda for themselves and control the process of a project, being part of a genuine partnership with adults. All forms of engagement are thought to provide valid opportunities for children to be heard and to be taken seriously (Lansdown, 2005) and the particular method of working with children needs to be chosen depending on the nature of the project (Shaw et al, 2011). Due to the logistical constraints of the work, children were engaged in the studies in this thesis through a process of consultation as defined by Lansdown. Children's views were taken seriously by the author and, in so far as the project could allow, were taken into account (Shier, 2001) and considered in earnest.

As there are inherent differences between adults and children in power and status, there are some fundamental principles to be followed to ensure that children's participation in data generation can be meaningful rather than manipulated or tokenistic (Hart, 1997; Lansdown, 2005). Children, for example, need to be given appropriate information so that they understand what it is that they are involved with and the limits of that involvement, know how they came to be part of the process and can make their own genuine and informed decision about whether to take part or not or to withdraw from the process at any point (Dockett et al, 2009; Hart, 1997; Lansdown, 2005). Legally, children will usually need to have informed consent granted by a parent or guardian, depending on their competence to provide consent themselves, (Lambert and Glacken, 2011, Health Research Authority, 2018). Ethically, however, including the child in the decision about whether or not to participate in research is vital in order to accept that person as a competent social agent in his/her own right. Children's agreement to be involved in research can be sought based on the concept of assent (Ford et al, 2007). For assent to be genuinely granted, children need to understand what it is that they are agreeing to and being given information, in a format that is comprehensible is an essential pre-requisite. Such a format might include statements written in the active voice, the researcher being named in the document rather than being referred to as an anonymous adult and plain English being used throughout (Ford et al, 2007).

1.6.1 PARTICIPATORY METHODS WITH CHILDREN IN PHYSICAL ACTIVITY RESEARCH IN SCHOOLS

Where children are involved as participants, as in the current thesis, age/ability appropriate methods are often used to enhance and enable the research process (Hill, 1997; Montreuil et al, 2021). Successful data collection is seen to be hinged on developing a trusting and confidential relationship between child and researcher through strategies aimed at building rapport and levelling power imbalances (Fargas-Malet et al, 2010; Hayball and Pawlowski, 2018; Huang et al, 2016; Punch, 2002). Practical tasks such as drawing pictures (Darbyshire et al, 2005), 'write and draw' (Knowles et al, 2013), taking or referring to photographs (Darbyshire et al, 2005; Eskola et al, 2018; Hayball and Pawlowski, 2018; MacDougall et al, 2004; Willenberg et al, 2010), map-based strategies (Darbyshire et al, 2005; MacDougal et al, 2004; Pawlowski et al, 2014) or 'go-along Interview' (Hayball and Pawlowski, 2018; Pawlowski et al, 2019a) have been used alongside interviews, focus groups and discussions with children to explore perceptions, facilitators and barriers of PA at school.

These task-based techniques are thought by some to focus attention, incorporate 'fun' and encourage children to express themselves freely in ways that are familiar to them and which offer choice and control (Darbyshire et al, 2005; Hayball and Pawlowski, 2018; Kirk, 2007; Tisdall, 2018). Non-verbal methods can help to sustain interest and motivation, particularly in younger children and allow verbal ideas to be developed more fully (MacDougall et al, 2004) thereby facilitating rich data generation (Huang, 2016). Matching the type of activity with the individual child is thought to be productive in the development of rapport in the research relationship (Irwin and Johnson, 2005) and multiple methods can enable children to describe their worlds in complementary ways resulting in a more comprehensive representation of what is important to them (Darbyshire et al, 2005) and may also help children to remember details of their experiences more easily (Hayball and Pawlowski, 2018).

However, what could be 'fun' for some individuals might not be so for others (Irwin and Johnson, 2005). While some children might choose drawing as a familiar and safe method for expressing themselves, others might feel patronised by being asked to engage in certain activities such as drawing a picture (Punch, 2002) or could find drawing and talking at once too much (Irwin and Johnson, 2005). Although adults might think that drawing, for example, is a fun and easy way for children to communicate their ideas, some children might not feel comfortable or competent to express themselves in that way (Einarsdottir et al, 2009; Punch, 2002). There may also be some difficulties associated with interpreting children's non-verbal contributions such as when an adult assigns meanings to a child's picture or photograph which were not intended (Barker and Weller, 2003; Darbyshire et al, 2005; Huang et al, 2016; Punch, 2002). As children are a heterogeneous group, it is also important to consider the needs of each individual in each specific research setting and to recognise that some will, at times, be competent to engage in the research process as adults do, without the need for special tasks (Punch, 2002). Likewise, some adults might find practical and artistic methods useful when it comes to expressing their own views.

Although participatory methods with children are thought to be suitable for encouraging children’s meaningful participation in research endeavours, they only go so far in accessing a truly child-centred perspective rather than an adult view alone of what data from children might mean. Unless children are involved through a fully participatory methodological approach, an adult-centric bias will be present in the decision-making, analysis, interpretation and dissemination of results (Montreuil et al, 2021). Adults, for example, can misinterpret children's verbal responses or pictures as they might see the world in a different light. Analysis being in the hands of children, without further interpretation being made by researchers, is thought to minimise this kind of researcher bias (Hayball and Pawlowski, 2018). Even with a high level of child involvement, however, power imbalances are difficult to level; adults will, often through necessity, need to take the lead in a research project especially at the beginning and until children gain confidence, understand the requirements and move towards taking greater responsibility (Nygren et al, 2017). Sufficient time and resources need to be made available for this quality level of engagement to occur (Lansdown, 2005). For effective interpretation of work with children, it is essential for the reader to understand how relationships between the researcher and child participants were negotiated and differences in power and social status (e.g. adult/child, role) addressed (Randall, 2012).

1.7 PHILOSOPHICAL UNDERPINNING OF THE THESIS

1.7.1 MIXED METHODS APPROACH

Traditionally, health research has often been conducted within one of two broad approaches; the positivist perspective, generally aligned with quantitative methods or the 'interpretivist' paradigm which utilises qualitative methods (Allsop, 2013). A positivist view on the nature of reality and the social world holds that the world is external and objective and therefore, can be observed independently by individuals, irrespective of their own ideas, beliefs or perceptions (Carson et al, 2001; Hudson and Ozanne, 1988). The aim of research in this paradigm is, therefore, to make generalisations which are time and context free that can explain real causes that precede behaviours/events in a closed system (Hudson and Ozanne, 1988). In this model, researchers make every effort to make logical, rational judgements about the objects/participants in their study and to minimise the influence of personal values and emotions in their work (Carson et al, 2001).

In contrast, the interpretivist stance is that the focus of research is on understanding what is going on in a particular context (Carson et al, 2001). People's actions can only be understood with relation to the meanings those people place on them and how those meanings are shaped with regard to values, beliefs and culture (Hudson and Ozanne, 1988, Allsop, 2013). Social reality is subjective (Allsop, 2013), constructed through interaction and in response to events. Researchers, themselves are part of the social world themselves and cannot remain entirely neutral as they engage in research endeavours (Allsop, 2013).

'Mixed methods' are, however, being used increasingly in health and social research (Allsop, 2013; Bazeley, 2018; Cresswell, 2003; Hanson et al, 2005; Srnka and Koeszegi, 2007) with growing recognition that research practices can be described along a continuum rather than as a dichotomy (Howe, 1988, Cresswell, 2003, Niglas, 2007), thus allowing for a combination of ideas and practices from both positivist and interpretevist stances. In combining wisdom and conventions from the two approaches (Allsop, 2013; Hudson and Ozanne, 1988) it is thought that a research question might be better understood than through considering it solely from one angle (Cresswell, 2015; Ozawa and Pongpirul, 2014; Sparkes, 2015; Risjord, 2001).

The studies in this thesis could be described as having an exploratory sequential mixed methods design (Cresswell and Plano Clark, 2011; Cresswell, 2015), in which earlier phases inform later parts of the project. This design was used as it allows integration of qualitative and quantitative data through a sequential process, enabling knowledge to build through the research process (Cresswell, 2015). An exploratory sequential design is described by Cresswell (2015) as having an initial phase using qualitative methods to explore the research problem with the results then being used to enhance the design of a quantitative component such as a measuring instrument or intervention. A third stage involves the use of the new component in a quantitative data collection and analysis (Cresswell, 2015). Whilst many study designs, such as that in this thesis, might incorporate further elements, these three stages are seen as being integral to an exploratory sequential design (Cresswell,2015) and are seen through the work in Chapters 4-6.

1.7.2 INCOMMENSURABILITY

There has been considerable debate about whether combining quantitative and qualitative approaches is possible given the philosophical differences between the stances. It has been argued that the two frameworks produce knowledge that is fundamentally different and incommensurable (Allsop, 2013), a position which has been named 'The Incompatibility Thesis' (Howe, 1988). Increasingly, however, it is recognised that research practices can be described along a continuum, with any particular study tending, perhaps, towards being either more qualitative or more quantitative (Howe, 1988, Cresswell, 2003). Howe (1988) puts forward the idea of the 'Compatibility Thesis' and has argued that contrary to the idea of mixed qualitative and quantitative approaches being epistemologically unsound, they are, in some senses, inseperable. Howe demonstrates how, at three levels of research practice, those of data, design and analysis and interpretation of results, it is difficult to justify a research situation where elements of the quantitative and qualitative approaches are not 'inextricably intertwined' (P12).

However, as mixed methods research will be founded on the use of philosophically opposing traditions, it could be criticised as being conceptually flawed, with consequent doubt cast on the value of results and their interpretation. As a mixed methods researcher, therefore, the decision-making process involved in designing a research project needs to be presented clearly with regard to inter-related ontological, epistemological and methodological issues (Cresswell, 2003; Grix, 2002).These philosophical concepts are defined in Figure 1.1.

In order to find out more about complex social systems, such as those involved in supporting children’s health behaviours, a theoretical underpinning is needed that enables a holistic exploration of that complexity from multiple angles, rather than a reliance solely on either understanding individual experience or on examining, for example, linear intervention-outcome pathways (Mingers, 2006). Critical Realism provides an ontological and epistemological framework on which to scaffold such health research (Walsh and Evans 2014).

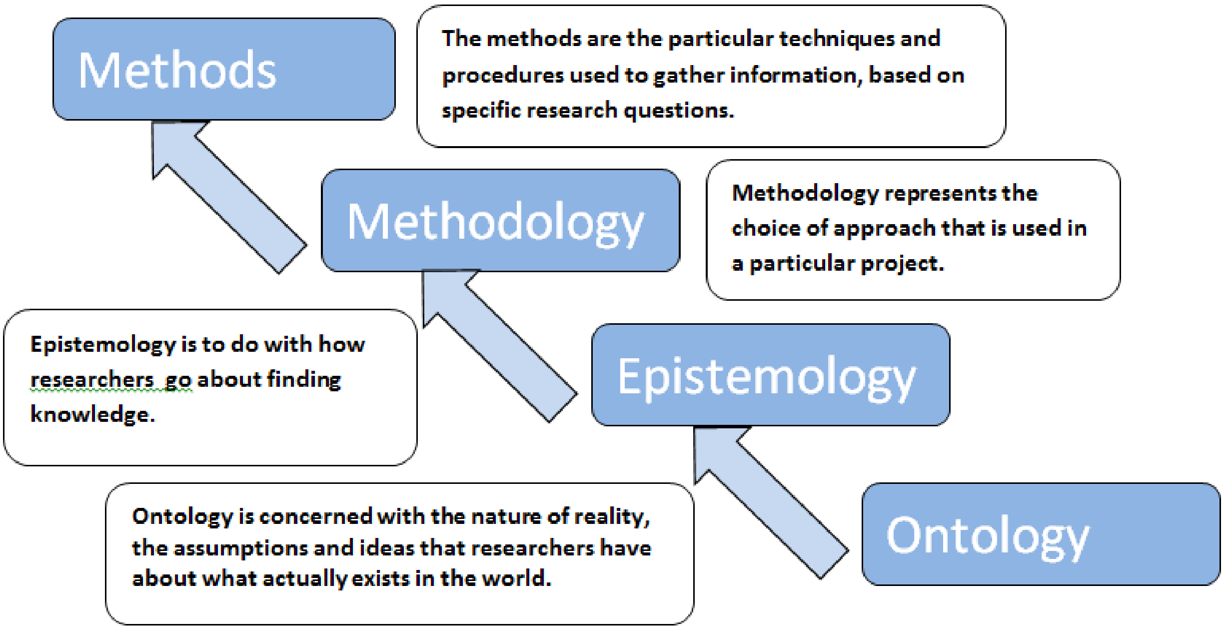


Figure 1.1 : Philosophical Concepts (Derived from Grix, 2002)

1.7.3 CRITICAL REALISM

Critical Realism offers a third perspective within which to understand the world (Clark et al, 2008; Maxwell and Mittapalli, 2010). Ontologically, this stance maintains that there is a social and physical world of entities that could exist independently of human knowledge, irrespective of how or even if it is perceived or conceived (Bhaskar, 2008; Clark et al, 2008; Maxwell and Mittapalli, 2010). What is seen and experienced at an 'empirical' level can be explained in terms of an underlying reality which forms a foundation for observable events (Saunders et al, 2009).

Roy Bhaskar, a British sociologist and philosopher described reality as being made up of three layers; the 'empirical', in which the world can be described in partial terms of what can actually be observed or measured; the 'actual' level of events and behaviours generated by the 'real' level which may not be observable, but which underlies the empirical and the 'real' in which exists structures/mechanisms/powers that can act independently of individuals (Bhaskar, 2008). These may be unobservable other than that their effects may be experienced or observed (Walsh and Evans, 2014; Sayer, 2000) such as in a research situation, where there is a power differential. This will still affect the relationship between researcher and participant whether or not it is recognised by any individual.

Causation in a framework of critical realism is not linear but results from a network of social, physical, natural and psychological objects and structures at the 'real' level which intertwine in various combinations, contexts or circumstances to create new events at the 'actual' level (Clark et al, 2008; Ryba et al, 2022) which may be observed at the empirical level (Clark et al, 2008). Full understanding of a phenomenon cannot solely be understood through observations, experiences and measurements made at the 'empirical' level. However, it is in examining the effects of underlying processes and social structures, that researchers can come to explain what is happening below the surface (Pratschke, 2003). Knowledge of the world through a critical realist lens is thought to be produced through a process of abduction/retroduction (McEvoy and Richards, 2006; Schiller, 2016). Detailed observations from multiple sources enable possibilities to be explored and those with the greatest explanatory power used to further understanding, in the knowledge that these explanatory theories are provisional and will need to be revised in the light of new information (Schiller, 2016).

Epistemologically, from a critical realism perspective, certain knowledge of the 'real' is unattainable. Rather, this reality can be perceived and understood in many different ways (Maxwell and Mittapalli, 2010). Using a combination of quantitative and qualitative methods, to suit specific research questions, and to '*reveal different facets of the same reality and…examine reality from different perspectives' (McEvoy and Richards, 2006 P72).* is thought to be an appropriate way of exploring phenomena within a critical realist framework (Danermark et al, 2005; Krauss, 2005; McEvoy and Richards, 2006; Pratschke, 2003; Ryba et al, 2022; Sayer, 2000; Schiller, 2016).

In the current study, a philosophical position of critical realism was thought to be applicable for investigating the complex systems and structures that might contribute to children's PA behaviours in the outdoor environment. Whilst there are processes and mechanisms occurring at a 'real' level, however, the data that are gathered in the current study may provide only some glimpses of this reality. As exploratory research, its reach was to explore the research questions and lay the groundwork for future studies which might seek to explain further the insights gained from this work.

1.7.3.1 CRITICAL REALISM AS FOUNDATION FOR MIXED METHODS IN THIS STUDY

This study is set within an **ontological** framework of critical realism. This approach assumes open systems and a causative model in which a myriad of mechanisms and entities at different levels operate to influence events and behaviours. As physical activity can be described as a complex behaviour, thought to be underpinned by numerous mechanisms (Hall et al, 2021), critical realism offers a suitable philosophical foundation for its study.

Epistemologically, in a framework of critical reality, it is not only important to learn about how people construe the world or simply to make observations about the world but also to understand the nature of the reality behind those constructions and observations. Superficial observations alone may not allow for a complete understanding of a social situation (Easton, 2010). In a framework of critical realism, a mixed methods **methodology** is viewed as being appropriate and necessary as the investigation of complex questions will require the use of a combination of methods (Danermark et al, 2005; Ryba et al, 2022). Quantitative methods could, for example, be used in an exploratory sense, as in Chapter 3 and Chapter 6 of this thesis, to help reveal general patterns or unexpected relationships and pave the way for further investigation of causal mechanisms (McEvoy and Richards, 2006; Mingers, 2006). Although the 'real' social world is an open system in which cause-effect patterns do not, necessarily endure, 'demi-regularities' or semi-predictable patterns with some stability which reflect underlying mechanisms coming into play in particular contexts, can be a useful starting point for seeking out explanatory causes (Lawson, 1997; Pawson, 2006). Danermark et al (2005) propose that quantitative research approaches are vital for identifying these systematic differences that could provide clues about generative mechanisms. Qualitative data are used to help to understand the circumstances in which regularities tend to occur (Danermark et al, 2005; Ryba et al, 2022) and to shine a light on complex concepts and relationships which are also essential in the formulation of explanatory theory (McEvoy and Richards, 2006).

At the level of **method,** it has been argued that both quantitative and qualitative data are fundamentally connected and '*virtually inseperable'* (Trochim, 2006). Trochim proposes that there is little difference between data collected either qualitatively or quantitatively and that any qualitative data can be assigned a meaningful numerical value (Trochim, 2006) and, conversely, that numerical values can only be fully understood by knowing the judgements and assumptions that underlie the numbers. Howe (1988) also questions the qualitative/quantitative distinction when it comes to data and argues that there are few circumstances in which they are not compatible and that even where it may be difficult to conceptually change some forms of qualitative data into numerical form, there seems to be no reason why a pluralistic attitude, where two forms of data are examined side by side should not be used. Moreover, methods themselves *'should be seen as free from ontological and epistemological assumptions (*Grix, 2002). In a framework of critical realism, mixing methods is viewed as being appropriate as the choice of method is thought to be dependent on the nature of the research problem (Grix, 2002; McEvoy and Richards, 2006) with researchers from any paradigm being able to choose methods freely (Sparkes, 2015).

1.8 THESIS RATIONALE, AIMS AND OBJECTIVES

With high levels of childhood overweight and obesity in primary aged children (NHS Digital, 2020), strategies are needed to ameliorate the problem. Being active is thought to be one way in which children can maintain a healthy body weight and accrue numerous other health benefits (DHSC, 2016). However, many primary school aged children do not meet government targets for PA NHS Digital, 2020) and levels of PA begin to decline during the primary school years (Farooq et al, 2018). Schools have been identified as key settings for promoting PA (Pate et al, 2006) although research to date is not conclusive about what school factors impact most on children's PA or about what constitutes a good intervention for promoting PA. There are differences in the provision that schools make for children to be active and significant variation in PA levels has been found between schools

Given the numerous challenges in the school setting associated with introducing and maintaining PA opportunities, there is a need to know where and how input is likely to be effective so that schools can direct resources wisely and enable children to be sufficiently active. A growing body of work suggests that children are inherently more active in the outdoor environment (e.g. Tremblay et al, 2015) and in ~~a~~ the primary school setting, outdoor activity could be facilitated, for example, through break times, which, as they are already in place, do not detract from lesson time or outdoor education possibilities which can be integrated naturally with the curriculum. Active transport to and from school may offer a further opportunity to contribute to greater daily PA without encroaching on curriculum time. Primary schools are also in a key position for working in alliance with parents to promote healthy behaviours (Clarke et al, 2013). Accurate knowledge is needed about what facilitates children's PA in the outdoor environment and how this can be enhanced by school involvement. Children's views are likely to be crucial for developing this knowledge as they represent a unique perspective that could be missed from an adult standpoint alone.

1.8.1 AIMS AND OBJECTIVES OF THE RESEARCH

There were 2 main aims of this research:

1. To gain a deeper understanding about what primary school factors relating to children's PA in the outdoor environment could be of importance when designing spaces and opportunities that might enable children to be more active.
2. To use this knowledge to develop a survey to evaluate how primary schools support children's PA in the outdoor environment.

In order to achieve these aims, 10 main objectives were devised which are addressed through 6 thesis chapters (Chapters 2-7) following this introductory chapter as illustrated in Table 1.2. The sequential nature of the research is illustrated in Figure 1.2, demonstrating how the findings from earlier chapters inform those that follow.

Chapter Number and Heading	Research Objectives	Aim
Chapter 2: The impact of school on physical activity: a review of factors involving the outdoor environment	1. To review the literature for school factors that might influence primary school children's PA in the outdoor environment.	1
Chapter 3: Focus group or individual interviews for exploring children's health behaviour: the example of physical activity	2. To establish an appropriate qualitative data collection method to use with primary school children in order to explore their views about how schools can help them to be active in outside spaces.	1
Chapter 4: What school outdoor environment factors are perceived by pupils, parents and staff to influence levels of physical activity in primary school children?	3. To gather information from children aged 9-11 and adults in primary school communities about their perceptions and observations of what they consider to be important aspects of the school environment relating to outdoor spaces which might influence PA in pupils.	1
Chapter 5: Quality of school outdoor environment survey (QSOE)	4. To apply the knowledge gained from objectives 1 and 3 to develop a Quality of School Environment survey for primary schools in order to capture factors relating to how schools support PA in the outdoor environment. 5. To pilot the survey in a sample of primary schools. 6. To describe how a sample of primary schools support PA in the outdoor environment.	2
Chapter 6: Which aspects of the school outdoor environment are associated with children's self-rated school day physical activity?	7. To investigate the relationship between primary school children's self-rated PA and school provision for PA in the outdoor environment in terms of physical, social and policy elements.	1
Chapter 7: General discussion	8. To apply the knowledge gained to refine the Quality of School Environment Survey and to produce a checklist for schools. 9. To apply the knowledge gained to make recommendations for schools regarding the promotion of children's PA in the outdoor environment. 10. To suggest possibilities for future research	1, 2

Table 1.2: Thesis outline with research aims and objectives

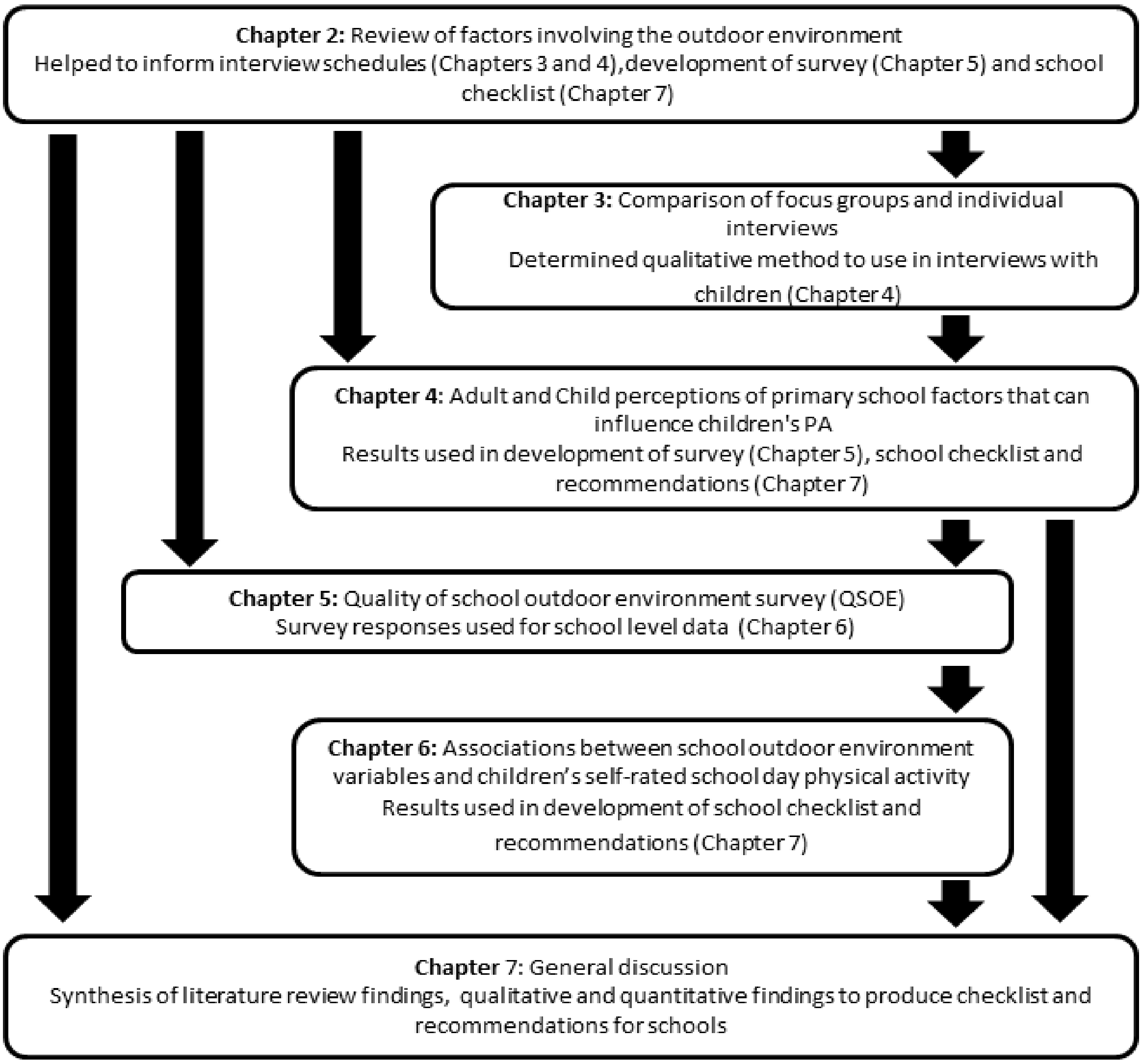


Figure 1.2: Sequential structure of thesis

1.9 THESIS OVERVIEW

Following this first, introductory chapter, in Chapter 2, the literature pertaining to primary school factors that might influence children being active in the outdoor environment, is reviewed and appraised in order to obtain a comprehensive overview of potential school-based factors that might influence children's PA.

A small study to explore the relative merits of focus groups and individual interviews when collecting information from children about their perceptions of PA opportunities and experiences in the primary school outdoor environment is described in Chapter 3. A quantitative content analysis and interpretation was undertaken to identify any differences between the two groups and to illuminate patterns which could exist in a structured way. In addition, an exploratory thematic analysis was used to gain deeper understanding of the differences between the methods. Results from this study were used to determine which method might be best suited to a broad exploration of primary school factors involved with children being active in the outdoor setting. This information informed the choice of method to be used in the next stage of the project.

Subsequently, as described in Chapter 4, individual interviews were implemented with children and adults at four Nottinghamshire primary schools with the aim of gaining more understanding about their perceptions and observations of what they considered to be important aspects of the school environment relating to outdoor spaces which might influence PA in pupils. Findings from this qualitative study were used to inform the content and development of a survey of primary schools, the Quality of School Outdoor Environment Survey (QSOE).

The development and administration of this survey are outlined in Chapter 5. Results from a pilot sample of sixty-eight English primary schools which completed the QSOE on-line are presented. These are discussed with reference to other UK and International school environmental survey data.

Associations between children's self-rated PA and school outdoor environmental variables, derived from the earlier stages of the project were identified in Chapter 6 through multi-level linear regressions and a small number of school factors were found to be positively and significantly associated with children's PA.In Chapter 7, the findings of these investigations were collated and synthesized to form a school checklist and recommendations for schools about some of the strategies and policies that they might use to facilitate children's PA in the outdoor environment.

CHAPTER 2

THE IMPACT OF SCHOOL ON PHYSICAL ACTIVITY: A REVIEW OF FACTORS INVOLVING THE OUTDOOR ENVIRONMENT

2.1 INTRODUCTION

In chapter 1, core issues relating to children's PA were outlined and the low rates of PA in primary aged children highlighted. It was shown that there are considerable differences between schools in children's levels of PA and that school-based interventions may have potential for promoting children's PA although systematic reviews examining the impact of school-based efforts to promote PA have indicated that the evidence is disparate and inconclusive. Further research is needed to demonstrate what aspects of school provision might be of most benefit for encouraging children to be active and to determine the reasons behind the variation in PA levels between schools. The value of the outdoor environment for PA promotion was explored and it was seen that being outside generally and in the realm of the school outdoor environment might be conducive to higher levels of PA. Schools could potentially engage children in active behaviours in the outdoor environment through education, supportive play environments and by instigating policies that advocate and support active travel.

A socio-ecological approach was proposed as a scaffold for understanding influences on children's PA. In socio-ecological models, interactions between the individual and social, physical environmental and policy factors are thought to determine children's active behaviours (Sallis et al, 2015). Thus, in order to gain deeper knowledge about how schools can facilitate children's PA behaviours in the outdoor environment, it is important to know what factors at the different levels of influence might have impact when children have opportunities to be active in the outdoor environment across the school day. Comprehensive school approaches extend the reach of the school environment by emphasizing links with families and the community. In utilising these partnerships, school promotion efforts can potentially extend further to include, for example active travel intervention.

In this chapter, the literature base providing evidence about school influences on children's PA in the outdoor environment will be explored with a view to understanding what school factors in the physical, social and policy domains might be involved with children being more active when they are outside and how schools can intervene at different points of the day to encourage children's engagement in PA. This narrative review is presented as a broad, exploratory examination of interventions which have investigated the effectiveness of primary school-based strategies for increasing children's PA in the outdoor environment, observational studies which have highlighted factors which might be important primary school-based correlates of children's PA and qualitative studies which, as they focus on the specific contexts and meanings that people have in their lives, may therefore provide detailed information about factors relating to particular school settings. School-based influences and potential strategies will be explored through four main topics; education in the school outdoor environment, active transport to school, equipment and resources, including social resources and school policies.

2.2 PHYSICAL ACTIVITY THROUGH EDUCATION IN THE-OUTDOOR ENVIRONMENT

Outdoor education has been described as '*teaching and/or learning and/or experiencing in an outdoor and/or out-of-school environment*' (Becker et al, 2017, P2). When children learn in the outdoor environment, associated benefits include their participation in and knowledge about healthy active behaviours (Outdoor Education Advisory Panel, 2020), being more engaged in their learning and getting more out of it, particularly with respect to challenge and enjoyment (Mannion et al, 2015) as well as improved educational attainment and enhanced physical and mental health (Dillon and Dickie, 2012).

One movement aiming to integrate children's learning with the outdoor environment in the UK is that of the 'Forest School.' The idea of Forest Schools came from Scandinavian concepts which place a value on the natural world as a teaching space and on the benefits that children gain through their interaction with nature (Murray and O'Brien, 2005). Key features of the forest school experience include regular learning opportunities in a woodland setting during which small groups of children are encouraged to explore and to be creative in their work by tapping into the resources on offer in the wild setting. As well as being thought to develop children's self-esteem and confidence and promoting co-operation and positive attitudes towards learning (Murray and O'Brien, 2005), children learning through Forest Schools have also been seen to have higher levels of PA than when they engage in routine classroom lessons (Austin et al, 2013).

Austin et al (2013) collected PA information from 59 children in Merseyside with the PAQ-C (Kowalski et al, 2004) and accelerometer. Questionnaire data revealed no significant differences in children's self-reported PA between baseline completion and follow-up after the Forest School activities. However, accelerometer measures taken mid-programme showed that there were differences in children's LPA on days when they participated in Forest School compared with during a normal school day. Through focus groups and a write-and-draw task, children also indicated that they thought that Forest School reduced levels of boredom and enabled them to take part in creative and enjoyable PA experiences.
In another small comparative study, examining differences between children's PA on Forest School days and traditional classroom learning, Lovell (2009) found that children's PA levels, as measured by accelerometer, were 2.7 times higher on outdoor learning days and even 2.2 times higher when compared with an active traditional day. When interviewed, children concurred with those from Austin et al's study in thinking that Forest School days allowed them to be more active and were more enjoyable than days in the normal school setting. In addition, children accrued nearly an hour and a half of MVPA on Forest School days, thus easily achieving the recommended level of 1 hour of MVPA daily. Aronsson et al (2015) found that children spent significantly more time in MVPA when they engaged in learning activities in their school grounds compared with in their classrooms and an even greater proportion of time being active when they were in a woodland setting compared with

outside or inside in the school setting. As this was a small study involving only 10 children, however, the findings are not generalizable to a wider population.

Several other small Scandinavian studies have investigated the level of PA in children undertaking formal education in the outdoor environment compared with PA levels during traditional class-based curriculum work. Objective measures have shown children to be over twice as active during outdoor education sessions compared with on traditional school days (Mygind et al, 2007). Romar et al (2019), too, found that children engaged in significantly more light and moderate PA on outdoor education days, with greater benefits of forest school activities being seen for pupils who routinely took fewer steps during a traditional school day than others. Fiskum and Jacobsen (2012) also noted by means of 4 trained observers that children's PA was consistently higher on days when children studied outside. A larger quasi-experimental trial, involving 16 demographically matched, paired classes, where one class of each pair participated in regular education outside the classroom and the other engaged in routine class work showed that those who had lessons outside were seen to have levels of PA which were significantly higher in boys who experienced outdoor classes whereas no differences were seen in girls (Schneller et al, 2017).

Alternative forms of learning in the outdoor environment have also been studied. Vetter et al (2020) investigated children's learning of maths times tables through a RCT involving 172 children across 2 schools, which compared classroom learning and practising maths skills outside whilst engaging in PA. Significantly higher MVPA, as measured by accelerometer, equivalent to 20% daily recommendation, was reported for children in the playground group during the maths lesson although there were no differences in PA between the groups during the rest of the school day.

The impact of school gardens on children's PA has been the subject of one longitudinal RCT in 12 schools (Wells et al, 2014). Children in the intervention groups compared with those in control groups demonstrated a significant yet small increase, amounting to 6 daily minutes of MVPA, over 2 years in PA during school days incorporating lessons spent in the school gardens. As children in the intervention groups were, on average, older than those in the control groups, it could be that the intervention did, in fact, have a stronger effect, compensating for some age-related declines in PA. However, differences in ethnicity between the groups too might have had an impact on PA data. One further study involved a comparison between children's pedometer-measured steps when they engaged in activities at an off-site outdoor day camp and their steps during the normal school day. Children took significantly more steps per hour when they were learning in the outdoor environment of the day camp compared with when they were back in the classroom (Finn et al, 2018).

A second UK initiative for schools, with a particular emphasis on PA in the outdoor environment, is the 'Daily Mile,' a fun, social and inclusive activity that can be slotted into 15 minutes of the school day (The Daily Mile, (n.d)) as an addition to the PA provided for through break times and PE. Since its inception in 2012, there have, to date, been only preliminary findings as to the efficacy of the Daily Mile programme to raise children's daily PA levels. Chesham et al (2018) found an increase of 9 minutes per day over several months in children's MVPA when the daily mile was introduced into an intervention school compared with at a control school although Daly-Smith et al (2019) raised a number of concerns regarding the conclusion of the authors that the Daily Mile intervention was effective for raising daily MVPA and cautioned that as yet, the benefits and drawbacks of participating in the Daily Mile are not fully known.

Morris et al (2019) explored the effect of one single Daily Mile session through an RCT, comparing children who took part and a group of others who continued with their lessons in class. Children's objectively measured MVPA was approximately 10 minutes higher in those participating in the Daily Mile. However, there was a marked difference between children's efforts during the Daily Mile endeavour, with the least active spending only one third of the time in MVPA and two thirds in LPA whilst the most active engaged in MVPA for the duration of the activity. As measurements were taken only during the intervention, it is not known whether children might have compensated later for the time spent in the Daily Mile by being more sedentary and effects of the Daily Mile over time were not assessed.

2.3 PHYSICAL ACTIVITY THROUGH ACTIVE TRANSPORT TO SCHOOL

The school commute is a functional journey which needs to be undertaken in some form by most children during term time and an established pattern for active transport is unlikely to be replaced by alternative activities. Travelling to and from school each day could provide opportunities for PA which contribute to children's recommended daily MVPA. Accelerometer measured ATS over 7 days has been found to be a behaviour associated with children who meet Government daily targets for MVPA (Wilkie et al, 2018) and other studies have reported higher levels of PA during the commute time in children who engage in ATS compared with those who are driven to school (Zhang et al, 2020) or higher levels of daily MVPA (Cooper et al, 2005; Cooper et al, 2006; Faulkner et al, 2009). Carver, (2011) too, found a positive relationship between ATS and accelerometer measured MVPA in children aged 10-12, although no significant associations between ATS and MVPA were recorded in younger children (aged 5-6). Whilst these studies are cross-sectional and causality cannot be determined, Cooper et al (2005) investigated the possibility that a link between ATS and PA could be, for instance, because more active students chose active transport modes rather than participation in ATS leading to pupils being more active. Although children who travelled actively during the week were more active than children who were transported by car, no significant differences were found between the children's PA levels at the weekend which could indicate that the positive association between ATS and PA was not necessarily explained by naturally active children choosing active modes of transport.

The critical role schools have to play in promoting participation in ATS is clearly set out in comprehensive/whole school approaches which have been advocated internationally (Institute of Medicine (IOM), 2013; McMullen et al, 2015; Public Health England, 2020a). In UK guidance for schools, ATS is suggested as one of 8 key principle for integrating PA opportunities into the school day (Public Health England, 2020a) and has been reported to be amongst the best practice features of Finnish whole-school PA development efforts (McMullen et al, 2015). It is recognised that schools do not operate in isolation and are part of wider community and family systems and partnerships (IOM, 2013; Public Health England, 2020a) which are, together, influential in changing health behaviours. As key players in these networks, schools can promote and offer multiple opportunities for children to be active throughout the school day and instigate policies and initiatives which can help to foster behaviours and attitudes which support a healthy and active lifestyle (IOM, 2013; Public Health England, 2020a) and life-long active travel habits (Sustrans, 2015).

Strong links between schools and parents are likely to be important for facilitating ATS in primary aged children as they are closely monitored and require parental support and agreement for active travel behaviours. As parents are the gatekeepers of their children's ATS (Giles-Corti et al, 2009), their own perceptions of ATS, are likely to be important influencing factors in whether or not their children will engage in active travel. Parental fears about road safety and crime, for example (Aranda-Balboa et al, 2020; Nikitas et al, 2019; Smith et al, 2020b; Stewart, 2012) and practical considerations such as weather and available time (Ahlport et al, 2008; Nikitas et al, 2019) have been reported as potential influences.

Numerous other individual, social, family, and environmental correlates of ATS might also have a bearing on whether or not children travel actively to and from school (Davison et al, 2008). These include factors such as distance to school (Smith et al, 2020b; Stewart et al, 2012), social interactions (Ducheyne et al, 2012; Smith et al, 2020b), demographics and school locational features (Everett Jones and Sliwa, 2016; Zhang et al, 2020).

2.3.1 SCHOOL FACTORS ASSOCIATED WITH ACTIVE TRANSPORT

Whilst schools might not be able to influence some of these aspects of the school commute, other school-related factors might be able to affect whether or not a child will engage in ATS. Everett Jones and Sliwa (2016), for example, found that the presence of cycle racks and promotion of ATS via the school were associated with a higher percentage of students walking or cycling to school. However, although this study involved a large, nationally representative sample of US schools, data from elementary, middle and high schools were combined so the exact significance of these factors for primary aged children cannot be assessed.

Limited storage for bike helmets and clothing has also been reported to be a barrier to ATS in qualitative work (Ahlport et al, 2008) and survey respondents have indicated that 'drop-off' policies, start and end times of school (Eyler, 2008) or age-restrictions for ATS (Martin and Carlson, 2005) are policies which might influence ATS. Where ATS is actively supported or promoted by the school, students aged 9-12 have been found to be more active (Faulkner et al, 2014) or more likely to participate in organised and group PA (girls) or individual PA (boys, Ward et al, 2015). Ward et al (2015), asked children to recall how often they had engaged in PA for 60 minutes a day over the past week and to report their free-time PA over the past 4 months. Memory for events over these time frames may not be accurate in primary aged children (Trost, 2007) which could have introduced error into the PA data of this work.

2.3.2 SCHOOL-BASED INTERVENTIONS INVOLVING ACTIVE TRAVEL TO SCHOOL

School-based interventions for encouraging ATS have included multi-faceted approaches, gamification and Safe Routes to School initiatives (SRTS; Pedestrian and Bicycle Information Center, 2007 p.1-2) such as Walk-to-School events (WTS; National Center for Safe Routes to School n.d) and cycle training. Walking School Buses (WSB) involving an adult-led group of children walking along a designated route (National Center for Safe Routes to School, 2020) could also be suitable programmes for schools to adopt.

2.3.2.1 MULTI-FACETED APPROACHES

School-based multi-pronged approaches have been used with varying success to promote children's PA through ATS. One large cluster RCT over 2 years involved schools through strategies such as teacher training, classroom resources and materials for dissemination. Parent reports indicated that numbers of students walking to school increased in the intervention schools although student reports did not show the same increase (Wen et al, 2008). The authors noted considerable differences between schools in the patterns of change occurring as a result of the intervention, indicating, perhaps school-level influence.

In a further non-randomised cluster controlled trial, Villa-Gonzalez et al, 2017 used multiple class-based strategies such as road safety exercises, learning about the urban environment, stories and games to promote children's ATS. Boys in the experimental group reported a slight increase in cycling immediately after the intervention although there was no self-reported increase in rates of walking to school for boys or girls. Rates of passive commuting did go up in the control group and this increase was attenuated by the intervention in the experimental group. Østergaard et al (2015), in a large, controlled trial, found no differences in self-reported commuter cycling behaviour between participating schools compared with control schools after structural changes were made near to the schools as well as schools taking part in motivational and training activities with pupils.

Two other small controlled interventions examined the effect of curriculum materials and family resources on active travel. Although the earlier study (McKee, 2007) found the intervention to be effective in increasing the distance travelled by an active means as measured by self-report, McMinn, (2012), using objective methods for measuring PA, did not find any differences in PA between the intervention and control groups although the materials did seem to help to offset a seasonal decline in ATS.

Other projects incorporating multiple approaches have demonstrated some success in changing ATS behaviours. An increased frequency of walking or cycling to school in experimental groups as reported by parents was found in a small non-randomised controlled programme in which schools promoted healthy nutrition and participation in PA (Jordan, 2008). Small increases in ATS were also reported post-intervention by parents, although not students, in a large, uncontrolled pre-post study of a multi-faceted Ride2school programme (Crawford and Garrard, 2013) and by children at one pilot school through a baseline school travel survey and class-based daily travel diaries (Zaccari and Dirkis, 2003).

2.3.2.2 WALKING SCHOOL BUS

A WSB could be an inexpensive intervention which could be organised by a school, with some evidence that it could have an impact on children's daily dose of MVPA. In one small, cluster RCT involving 8 schools, children who received a WSB intervention increased active commuting time by ~32% and objectively measured daily MVPA (~2 minutes), whereas these both decreased over 1 month in children who were at the control schools (Mendoza et al, 2011). Sirard et al (2008), also conducted a very small, short term pilot RCT which showed that 5 children in a WSB group achieved an extra 14 minutes of MVPA each day in the commuting time before school although no group differences between walkers and control children were found in total daily MVPA over the whole measurement period of 2 weeks. This experimental data supports other small, quasi-experimental studies which have also demonstrated benefits of WSB interventions in terms of increased prevalence of children walking to school over 2 years (self-reported) and higher levels of accelerometer measured PA daily (Heelan et al, 2009) or proportions of children travelling actively to school after 1 year, assessed by self-report compared with control groups (Mendoza et al, 2009). Despite parental enthusiasm for this type of scheme, however, and enjoyment of social aspects (Kong et al, 2009), safety and organisational issues as well as a considerable investment of time and effort by schools and volunteers have been seen to be challenges for implementing a WSB programme in the longer term (Kong et al, 2009; Smith et al, 2015).

2.3.2.3 SAFE ROUTES TO SCHOOLS INTERVENTIONS

Rowland et al (2003), in a cluster RCT involving 21 schools, investigated the impact of schools receiving expert advice with respect to developing and implementing travel plans. Whilst the aim was to increase ATS, travel patterns in young people were not seen to change any more than in control schools, although more schools who received the advice developed travel plans compared with control schools. Cycle training, too, was found to have no significant effects on parent reported cycling levels of pupils cycling to school in a small cluster RCT (Ducheyne et al, 2014) or on frequency of parent reported ATS cycling behaviours in a controlled cohort analysis (Goodman et al, 2016).

Staunton et al (2003) reported a considerable increase in ATS during the first two years of a county-wide SRTS programme although the ‘show of hands’ data collection used to determine take-up of the programme proved to be inaccurate and incomplete and several participating schools did not complete the survey. A moderate short-term increase in ATS has also been shown after a Walk-To-School-Day (WTS) promotion (Merom et al, 2005) with post-campaign parent telephone interviews and school evaluations being used to assess take up of the event. Schools were seen by parents as crucial for raising awareness of the event. In a further small controlled study investigating a SRTS promotion, rates of ATS were significantly higher, almost doubling, at the intervention school on the actual day of the event (Bungum et al, 2014) although at a 1 week follow-up, rates of ATS had returned to their baseline levels. This was in contrast to Buckley et al (2013) who observed, via head-count at the school gates, sustained increases in ATS up to 2 weeks after a SRTS event at 2 case-study schools with no increases being seen in a comparison school.

2.3.2.4 GAMIFICATION

Gamification is a newer strategy that has been utilised to improve the uptake of ATS. Savolainen et al (2020), working within a framework of social cognitive theory developed an intervention to promote ATS involving empowerment and gamification in conjunction with children, parents and teachers. In particular, parents were given opportunities to express concerns and suggest how to deal with safety issues. Teachers designed weekly tasks linked to the school curriculum for children to complete during their daily commute involving competitive, problem-solving, creative and physical activities. After a qualitative, thematic analysis of focus group data, the authors concluded that motivation to engage in ATS after use of the intervention was enhanced due to engagement of children and teachers in the project, a sense of working together towards a common goal and social aspects such as being able to walk or cycle to school with a friend.

Coombes and Jones (2016) evaluated the impact of a city-wide scheme for encouraging active commuting through the use of smart-cards which residents could tap onto street boxes and schools competing with each other in order to claim rewards. They found no changes in terms of accelerometer-measured PA over 5 months in the intervention group although MVPA levels were seen to decrease slightly less in the intervention group than in the control group. There was also some evidence that children in the intervention group were slightly less active than in the control group during weekday evenings, suggesting that there could have been some kind of compensatory behaviour from having been more active during the day.

In a recent systematic review of controlled quantitative designs only, set predominantly in primary schools, the authors concluded that PA can be successfully increased by Active Transport interventions and that these do not need to be complex (Jones et al, 2019). A combination of WSB and educational strategies was recommended for schools aiming to increase ATS. However, 16 out of 17 studies were given a weak quality rating overall and the authors commented on difficulties associated with comparing studies and their effectiveness when outcomes, intervention strategies and designs are so varied.

2.4 PROVISION OF EQUIPMENT AND RESOURCES

Break times in the school day offer additional opportunities for PA alongside curriculum provision of Physical Education (PE) and although some research shows that both time periods seem to be under-utilised in terms of the proportion of them spent by children engaged in active pursuits (Hollis et al, 2016; Kobel et al, 2015 a; McGall et al, 2011; Ridgers et al, 2009; Waring et al, 2007; Wood and Hall 2015), other studies show school breaks to be times when children have higher average levels of PA (Dessing et al, 2013; Massey et al, 2018).Playtimes are viewed by children as important occasions to socialise, to engage in unstructured activities of choice and to be physically active (Blatchford and Baines, 2006). Providing equipment and resources during leisure periods could be one way in which children retain choice and self-determination and yet be offered enticing and exciting opportunities to engage in more PA.

Numerous qualitative, observational and experimental studies have explored aspects of the primary school physical, social and policy environment that might make a difference to children's active behaviours when they are outside during school hours. These will be considered in the following sections under the headings of Equipment and Activities, School Landscape and Design features, Altering School Grounds, Space, Time for Playtime, General School Policy, Weather Policy, Peer Influences and Adult Support and encouragement.

2.4.1 EQUIPMENT AND ACTIVITIES

Effects of studies investigating the impact of altering equipment provision on children's PA or the association of equipment and activities with children's PA are summarised in table 2.1. In qualitative studies, children and adults have described the importance of fixed and moveable equipment such as trim trails, monkey bars, rubber tyres, skipping ropes, line markings or balls for being active (Martínez-Andrés et al, 2017; Parrish et al, 2012; Powell et al, 2016; Willenberg et al, 2010) and boys, specifically, have expressed their desire for equipment such as slides, obstacle courses and climbing facilities, whilst girls have reported a liking for congregating in small, cosy places such as 'nest-type' swings and small huts (Pawlowski et al, 2014).

The preference for boys to engage in ball-sport activities such as football has also been identified through focus groups whilst girls have reported more variety in the activities that they choose during their recreational times at school (Martínez-Andrés et al, 2017). Children have identified an absence of desired or appropriate equipment (Caro et al, 2016; Pawlowski et al, 2014; Pawlowski et al, 2018) or inability to access equipment due to policy, overuse or its condition (Caro et al, 2016; Willenberg et al, 2010) as being barriers to PA at recess time. Queuing for equipment or playing with items such as a sand-pit might also be detrimental for PA levels (Powell et al, 2016).

Researchers have investigated whether the availability of fixed and loose playground equipment and playground markings is associated with PA levels at playtime. Having loose equipment available has been found to be associated with MPA (McKenzie et al,2010; Parrish et al, 2009b; Ridgers et al, 2010a; Roberts et al, 2013;) and VPA (Willenberg et al, 2010; Zask, 2001). Proportions of children undertaking moderate levels (Willenberg et al, 2010) or vigorous levels (Dyment et al, 2009) of activity were also higher in schools where there was fixed playground equipment and having a higher number of fixed play items in the school grounds has been shown to be associated with higher levels of activity (Nielsen et al, 2010; Nielsen et al, 2012; Taylor et al, 2011).

Intervention Studies — + positive, - negative. 0 no effect of intervention. **Bold indicates large CRCT**

Factor	Crust, 2014	Stratton, 2000	Stratton &Mullan, 2005	Barnas, 2018	Blaes, 2013	Baquet, 2018	Kelly, 2012	Mayfield, 2017	Elder, 2011	Ridgers, 2007a	Ridgers, 2007b	Ridgers, 2010b	Lopes, 2009	López-Fernández, 2016	Van Kann, 2017	Loucaides, 2009	Huberty, 2011b	Janssen, 2015	Stellino, 2010	Barton, 2014	Howe, 2012	Verstraete, 2006	Bundy, 2009	Bundy, 2017	Engelen, 2013	Hyndman, 2014a	Hyndman, 2014b	Engelen, 2018	Méndez-Giménez, 2017	Huberty, 2014	Huberty, 2011a	Saint-Maurice, 2014
loose play equipment																			+ 0	+	+	+	+	+	+	+	+	+	+	**+ -**	**+ -**	**+ -**
fixed play equipment																																
line markings/ marked zones	+	+	+	+	**+**	**+**																										
line markings +resources							0	**0**	**0**	+	+	+	+	+	+	+	+	**+**														
ball games especially football																																
access to equipment																																
equipment quality/design																																
aesthetics																																
diverse games																																
Absence of facilities																																

Observational Studies — + effect of factor, - negative effect of factor, 0 effect of factor on PA

Factor	McKenzie, 2010	Parrish, 2009b	Ridgers, 2010a	Roberts, 2013	Willenberg, 2010	Nielsen, 2010	Nielsen, 2012	Taylor, 2011	Dyment, 2009	Anthamatten, 2014	Van Kann, 2016	Haug, 2010	Dalene, 2016	Zask, 2001
loose play equipment	+	+		+	+									+
fixed play equipment			+		+	+	+	+	+	+	+	0	0	+
line markings/ marked zones		+	0								0	0		
line markings +resources														
ball games especially football														
access to equipment														
equipment quality/design														
aesthetics														
diverse games														
Absence of facilities														

Qualitative Studies — + facilitator of PA, - barrier to PA

Factor	Caro, 2016	Eskola, 2018	Parrish, 2012	Pawlowski, 2014	Pawlowski, 2019b	Powell, 2016	Willenberg, 2010	Martínez-Andrés 2017
loose play equipment	+	+	+	+	+	+	+	
fixed play equipment	+ -	+			+		+	
line markings/ marked zones							+	
line markings +resources								
ball games especially football				+				+
access to equipment	+						+	
equipment quality/design	+						+	
aesthetics	+							
diverse games		+						
Absence of facilities	-			-	-			-

Table 2.1: School factors studied/identified in qualitative, observational and interventional studies investigating Equipment and Activities

In particular, high bars and soccer goals have been identified as specific items of equipment which are associated with higher levels of MVPA at break time (Van Kann et al, 2016). Conversely, the availability of equipment (Haug et al, 2010; Parrish et al, 2009b) has also been shown to have no association with the proportion of children engaging in MVPA and even to be negatively associated with children's compliance with MVPA guidelines (Gomes et al, 2017). The quantity of equipment too, (Dalene et al, 2016) has also been shown to have no association with MVPA.

Where balls were available, children were seen to engage in more VPA (Zask et al, 2001) although the availability of other loose equipment was not related to children's activity levels. Willenberg et al, (2010) observed a greater proportion of children engaging in MPA where there were playground markings of various forms than in areas where there was unmarked bitumen. Parrish et al, (2009b) also noted higher activity levels in areas where painted targets were in place. However, playground markings were not associated with any particular level of PA in other studies in primary school children (Haug et al, 2010; Ridgers et al, 2010a; Van Kann, 2016).

Experimental work studying the effects of providing equipment and resources has predominantly explored the effects of providing line markings/zoning with or without additional equipment/social resources or loose equipment with or without social resources (See Table 2.1). Characteristics of interventional studies are shown in Table 2.2.

First Author, date	Country where study took place	Study Design	Objective measure of PA	Direct observation of PA	Children (n) *Observational scans*	Schools (n)	Age of children (years) [Average]	Follow-up>6 months	PA across **whole/** school day
Crust, 2014	UK	CT		✓	218	16	10-11	✓	
Stratton, 2000	UK	CT	✓		47	2	5-7		
Stratton &Mullan, 2005	UK	CT	✓		99	8	7-11		
Barnas, 2018	USA	PP	✓	✓	98 *364*	2	10-11		
Blaes, 2013	France	CRCT	✓		382	2	6-11		
Baquet, 2018	France	CRCT	✓		283	3	6-11	✓	
Kelly, 2012	Australia	CT	✓	✓	126	4	[6.5]		
Mayfield, 2017	USA	CRCT		✓✓	*3588 1766*	4	9-11	✓	
Elder, 2011	USA	CRCT		✓	*12639*	13	5-7	✓	
Ridgers, 2007a	UK	CT	✓		297	26	5-10		
Ridgers, 2007b	UK	CT	✓✓		470	26	5-10	✓	
Ridgers, 2010b	UK	CT	✓✓		232	26	5-10	✓	
Lopes, 2009	Portugal	PP	✓		158	2	6-12		
López-Fernández, 2016	Spain	CRCT	✓		223	3	[7.1]		
Van Kann, 2017	Netherlands	CT	✓		376	14	8-11	✓	
Loucaides, 2009	Cyprus	CRCT	✓		247	3	[11.1]		
Huberty, 2011b	USA	PP	✓		93	2	[9.6]	✓	✓
Janssen, 2015	Netherlands	CRCT	✓	✓	1486 *72*	8	6-12	✓	
Stellino, 2010	USA	PP	✓		61	1	7-10		
Barton, 2014	UK	PP	✓		52	2	9-10		
Howe, 2012	USA	CT	✓		27	2	8-9		✓
Verstraete, 2006	Belgium	CRCT	✓		235	7	10-11		
Bundy, 2009	Australia	PP	✓		12	1	5-7		
Bundy, 2017	Australia	CRCT	✓		226	12	5-7		✓
Engelen, 2013	Australia	CRCT	✓		226	12	5-7	✓	✓
Hyndman, 2014a	Australia	CT	✓	✓	275	2	5-12	✓	
Hyndman, 2014b	Australia	PP		✓	123	1	5-12	✓	
Engelen, 2018	Australia	PP		✓	111	1	5-12		
Méndez-Giménez, 2017	Spain	CT	✓		146	1	5-12		
Huberty, 2014	USA	CRCT	✓	✓	667 *1082*	12	8-11		
Huberty, 2011a	USA	CRCT	✓		262	4	8-11	✓	✓
Saint-Maurice 2014	USA	CRCT			393	12	8-11		
Anthamatten, 2011	USA	Q-E		✓	*264*	9	6-11		
Brink, 2011	USA	Q-E		✓	*10808*	9	6-11	✓	
Nigg, 2019	USA	CRCT		✓	1367	24	6-11	✓	✓
Hamer, 2017	UK	CRCT	✓		347	7	5-11		✓
Raney, 2019	USA	CT		✓	437	2	5-10		
Van Dijk-Wesselius, 2018	Netherlands	CT	✓	✓	700	9	7-11	✓	
Powell, 2018	UK	PP	✓	✓	81	1	5-11		
D'Haese, 2013	Belgium	PP	✓		187	3	9-12		✓
Harten, 2008	Australia	PP		✓	*74*	1	10-11		
Wood, 2014	UK	RM	✓	✓	25	1	8-9		
Horne, 2009	UK	CRCT	✓		89	2	9-11		✓
Hardman, 2011	UK	CT	✓		236	3	7-11		✓
Foote, 2017	UK	CT	✓		62	1	9-11		
Galbraith, 2017	UK	CT	✓		20	1	8-9		
Bleeker, 2015	USA	CRCT	✓	✓	1573	29	10-11	✓	
Beyler, 2014	USA	CRCT	✓		1537	27	10-11	✓	
Yildirim, 2014	Australia	CRCT	✓		842	8	[8.2]	✓	
Dudley, 2018a	Australia	CRCT	✓	✓	*713*	6	5-12	✓	
Efrat, 2013	USA	CRCT	✓		161	3	9-10		
Ernst and Pangrazi, 1999	USA	CT			>600	5	10-12		
Pangrazi, 2003	USA	CT	✓		606	35	8-9		✓
Taylor, 2018	UK	PP	✓		56	2	9-10		

Table 2.2 Characteristics of intervention studies: PP-Pre-Post No control CT-Controlled Trial

CRCT-Cluster Randomised Controlled Trial RM-repeated measures Q-E Quasi-Experimental

2.4.1.1 LINE MARKINGS AND ZONING

Several controlled trials, including 2 cluster RCTs (Baquet, 2018; Blaes, 2013) have provided some evidence that introducing line markings or colourful zoning to the school playground can have positive effects on children's PA (See summary tables 2.1 and 2.2). However, effects equate to only small changes in amounts of PA such as a 7.5% increase in observed PA behaviours (Crust et al, 2014) or a 1.4% increase in percentage of time spent in MVPA (Blaes et al, 2013) post intervention. A strength of Blaes et al's study was that children were able to use their newly painted playgrounds for 2 weeks before post-intervention PA measurement took place, thus allowing for the chance for a novelty effect to start to decline. Whilst loose equipment was added alongside line markings in this study, however, this was not discussed as a possible contributor to the increased PA. Baquet et al (2018) demonstrated that there were some long-term effects of their playground zone-marking intervention, with the intervention group showing significant increases in LPA at 6 months and increases in MVPA after 12 months. Children have been seen to benefit from zoning in different ways. Barnas et al (2018), for example, observed that boys engaged in more PA when they chose to play in zones that offered structured, team games with physical contact whereas girls, on the other hand, were more active when able to play in zones which offered more opportunities to be creative with their games.

2.4.1.2 COMBINATIONS OF LINE MARKINGS AND OTHER RESOURCES

When playground markings have been combined with other equipment, intervention effects have been more mixed. Positive results have been found where line-markings have been combined with games equipment (Lopes et al, 2009; López-Fernández et al, 2016), games equipment and space allocation (Loucaides et al, 2009), games equipment and staff training/supervision (Huberty et al, 2011b; Ridgers et al, 2007a; b; 2010b; Van Kann et al, 2017) or games equipment, space allocation, monthly themes and active adult engagement (Janssen et al, 2015). Although Loucaides et al (2009) measured increases in PA after a small cluster RCT, however, these represented only small changes in the number of steps taken during break time. A larger increase in pedometer steps was reported by López-Fernández et al, (2016) who reported an increase in boys from 20% to 30.2% of their daily recommended steps and from 20.4% to 33.8% in girls after playground markings and loose equipment were provided. In a larger study, Van Kann et al (2017) measured a 5.4% increase in LPA at 12 month follow-up although no intervention effect was seen on MVPA. This large controlled trial involved 14 paired intervention and control schools and utilised GPS to confirm children's locations at break times.

Janssen et al (2015) demonstrated through their cluster RCT that a greater proportion of children were engaged in accelerometer measured MVPA during a 15 minute recess and were active at a higher intensity than were children in a control group. This intervention effect was found to be greater for girls and older children and was sustained over the course of a whole academic year. Levels of PA across the whole day, however, were not measured and, due to the many strands of the trial, it was not possible to ascertain which parts of the intervention were of most benefit.

A further study combining playground markings, games equipment, staff training and pupil instruction (Mayfield et al, 2017) did not lead to differences overall between intervention schools and control schools in the proportions of children engaging in MVPA as measured by SOPLAY after a 1 year follow-up period. Elder et al (2011) also found no effect on observed PA in the intervention group when game markings and organised walking and activity groups were established. Elder et al noted that the control schools in their study were led by head teachers who were committed to health improvements and were motivated to buy new equipment for their schools during the project. Qualitative enquiry revealed that the intervention schools were not equally enthusiastic or supportive of the study and were concerned about teacher and class time taken up by the project.

One study measuring PA across the whole school day as well as during recess found sustained increases in children's PA after 7 months (Huberty et al, 2011b). Without a control group, however, it is not possible to attribute changes to the intervention with any confidence and the level of change was small in real terms, representing 2.5 minutes of recess MPA and 2.2 minutes of recess VPA. Ridgers et al (2007b) also found sustained increases in children's post-intervention PA during recess and lunch breaks at 6 months post intervention with experimental school children engaging in 4.5% MVPA and 2.3% more VPA during break times than control children. This effect tailed off by 1 year post intervention (Ridgers et al, 2010b).

2.4.1.3 LOOSE EQUIPMENT

Interventions where loose equipment has been introduced into the playground have had some success in promoting PA demonstrated mainly through small pre-post tests and controlled studies as shown in the summary tables 2.1 and 2.2. These positive findings have also been confirmed in cluster controlled trials. Verstraete et al (2006), for example, reported that an intervention providing games equipment during lunch break increased the time children in the experimental group spent engaged in MVPA by 13% compared with a decrease of 10% in the control group. While teacher support was included as a component of the intervention, however, this was not discussed by the authors as being a potential motivator for children's PA.

Introducing moveable materials such as boxes, tyres and crates to encourage creative and imaginative play has also been shown to facilitate modest increases in outdoor PA amounting to 1.8 minutes more MVPA during recess in young primary aged children receiving the intervention compared with children at control schools (Bundy et al, 2017; Engelen et al, 2013), with gains still being apparent after 2 years in 1 school (Engelen et al, 2013). No significant changes to PA across the whole school day were reported. Greater proportions of children across the whole primary age range engaging in higher intensity PA have also been found after 8 months (Hyndman et al, 2014a;b) and 2.5 years (Hyndman et al, 2014b) post-intervention.

Types of change in play behaviour were studied in more detail through the use of the System for Observing Outdoor Play (SOOP) which demonstrated that the provision of recycled materials encouraged a wide variety of active, creative and construction play behaviours (Engelen et al, 2018). Hyndman et al (2014a) also noted that the ways in which children used recycled materials changed over an eight month period from using them as props for imaginative play to building blocks for construction activities later on. This could indicate that children were able to find new and interesting ways of adapting their responses to resources as they lost interest in old games.

Three cluster RCTs have reported differential effects of a playground intervention comprising four conditions; ‘equipment’, ‘staff training’, ‘equipment and staff training’ or ‘control’. In the first, MVPA decreased in all conditions over 1 school year for healthy weight girls (Huberty et al, 2011a), although increases were seen for healthy weight boys and overweight girls with a combination of equipment and staff training. In a later trial, (Huberty et al, 2014), provision of ‘equipment and staff training’ increased MVPA in boys whilst the ‘staff training’ only and ‘equipment’ only conditions led to a decrease in MVPA for boys and girls. Saint-Maurice et al (2014) also reported that children who were less active at baseline testing reduced the amount of time spent in MVPA more than their more active peers when trained staff were present on the playground.

2.4.2 SCHOOL LANDSCAPE AND DESIGN FEATURES

In the following sections, the impact that the design of the school outdoor environment and implementation of school policies has on children’s PA in the outdoor environment at school will be considered. Table 2.3 shows a summary of the effects of studies investigating the impact of changing facets of the school landscape on children’s PA or associations of school features with children’s PA. Characteristics of intervention studies are shown in Table 2.2.

Some studies have examined the relationship between specific physical features of the school outdoor environment and children’s PA. In one, Martin et al (2012) found that for every 100m^2 increase in grassy area for play, children accrued an additional 4.5 minutes of MVPA at break time each day. More than double the proportion of children have also been observed to engage in VPA on grassy surfaces compared with hard surfaces (Dudley et al, 2018b). Conversely, having access to a football field (Haug et al, 2010) or presence of green space (Van Kann et al, 2016) were not associated with primary school children being physically active and open grassy areas with few distinguishing features and no equipment have also been found to be spaces where children engaged in the lowest levels of activity (Anthamatten et al, 2014; Dyment et al, 2009).

Children’s PA has also been found to be positively associated with soft play surfaces in some other work (Parrish et al, 2009b) and Brink et al (2010) reported that children who played in soft surface areas of re-designed playgrounds were more active than those in a control group. A small experimental study also measured higher levels of MVPA in children who were allocated to play on a field compared with those who played on a hard-play area (Wood et al, 2014) and found that playing on grass reduced the gap between boys’ and girls’ levels of PA.

Using an audit designed to measure aspects of school physical environments (Jones et al, 2010), boys were found to engage in higher levels of lunchtime MVPA where schools provided more items listed in the ‘Sports and Play Provision’ component and girls where schools had high ratings for the ‘Design of the School Grounds’ component. In the same audit, no significant associations were found between children’s PA and ‘Aesthetics,’ including the presence of trees, planted beds, art-work, graffiti, litter and noise or ‘Other Facilities’ such as drinking fountains, benches, wildlife gardens and picnic tables. Van Sluijs et al (2011), on the other hand, reported the availability of higher quality facilities to be associated with children being more active.

Internationally, there have been initiatives to ‘green’ up school grounds, with a focus on developing diverse, natural landscapes with a view to enhancing children’s play and learning experiences at school (Bell and Dyment, 2006; Dyment and Bell, 2007). Greened spaces have been observed to be popular areas for both girls and boys to play (Lucas and Dyment, 2010) and places where the highest percentage of boys and girls engaged in MVPA as observed through SOPLAY (Dyment, Bell and Lucas, 2009). One survey which requested information from parents, teachers and administrators revealed consistent reports of more MPA and LPA in young people in schools after their grounds had been developed to provide diverse areas for recreation (Dyment and Bell, 2008). Girls in particular have been seen to spend more of their outdoor time in MVPA when they have a woodland area to play in compared with those who do not (Pagels et al, 2014).

Factor	Intervention Studies + positive, - negative. 0 no effect of intervention **Bold indicates large CRCT**														Observational Studies + effect of factor, - negative effect of factor 0 effect of factor on PA																												Qualitative Studies + facilitator of PA - barrier to PA								
	Anthamatten, 2011	Brink, 2010	Nigg, 2019	Hamer, 2017	Raney, 2019	Van Dijk-Wesselius, 2018	Powell, 2018	Ridgers, 2007a	Ridgers, 2007b	Ridgers, 2010b	Loucaides, 2009	D'Haese, 2013	Harten, 2008	Wood, 2014	Harrison, 2011	Parrish, 2009a	Parrish, 2009b	Ridgers, 2010a	Nielsen, 2010	Nielsen, 2012	Taylor, 2011	Dyment, 2009	Anthamatten, 2014	Pagels, 2014	Martensson, 2014	Van Kann, 2016	Haug, 2010	Faulkner, 2014	Dalene, 2016	Massey, 2018	Martin, 2012	Leatherdale, 2010	Escalante, 2012	Fairclough, 2012	Van Sluijs, 2011	Pereira, 2020	Dudley, 2018b	Jones, 2010	Mantjes, 2012	Kobel, 2015a	Ridgers, 2011	Ridgers and Stratton, 2005	Caro, 2016	Pawlowski, 2019b	Willenberg, 2010	Snow. 2019	Eskola, 2018	Coen, 2019	Hyndman, 2015	Martínez-Andrés, 2017	Pawlowski, 2014
field/soft/grassy surfaces			+											+			+						-	+		0	0				+						+						+	+	+	+					
greened areas																						+		+	0	0																		+			+	+			
space available/ playground area											+	+	+			0		+	0	0						+			0				+	+	0	-							+	+		+	+		+	+	+
number of active facilities																																						+													
suitable clothing																																															+				
longer recess/ time for PA								+	+	+-						+-	+-							+-						+					0				+	+	0	0									
written policy for PA																					0						+	+				+			-																
altering school grounds	0	**+**	**0**	**0**	+	0	+																																												
lack of space/lack of access to space																																															-			-	-
diverse facilities																																											+	+		+	+	+			
poor weather conditions															+																																+-			-	-

Table 2.3: School factors studied/identified in qualitative, observational and interventional studies investigating school landscape features and policies

However, despite reporting natural and green features to be favourite areas of the school, children are not always more active in or near those areas. Martensson et al (2014) compared PA at two contrasting schools which varied in terms of their natural landscaping. Children in both schools liked natural features although there were no significant differences in measured PA between the schools despite open-ended play occurring more often near greenery. Both girls and boys were able to become involved in games near to natural features, indicating that their incorporation into school playground design could be important for girl's PA.

2.4.3 ALTERING SCHOOL GROUNDS

Several studies have utilised extensive playground renovations to examine the effect of changing the school outdoor landscape on children's PA (See Tables 2.3 and 2.2). Two quasi-experiments found that children at schools with new 'learning landscapes' playground designs incorporating play equipment, games zones, informal seating areas and greened spaces used those spaces significantly more than children did in matched control schools, particularly when the playgrounds were newer (Anthamatten et al, 2011; Brink et al, 2010). However, only in 1 study (Brink et al, 2010) were children significantly more active, with energy expenditure still greater in the altered school grounds 2 years post-intervention.

Nigg et al (2019) conducted a cluster RCT involving Learning Landscapes schools and a PA curriculum delivered during lunch breaks with no differences being seen between intervention and control schools. Nigg et al used survey, accelerometer and SOPLAY to measure PA so that limitations of each method could be addressed by the other data collection techniques and research assistants were also blinded to intervention conditions thus eliminating the possibility that results could be biased due to researcher expectations. The 'Camden Active Spaces' project (Hamer et al, 2017) too found no significant impact on MVPA during school time or throughout the whole day as a result of extensive playground re-modelling. Younger children showed reduced daily sedentary time and increased daily LPA which persisted after a one year follow-up period. Random allocation of schools was not possible in this study due to selection of schools by the Borough Council and numbers needed for adequate power to detect small changes in MVPA were not reached.

A controlled trial where wide-scale changes, incorporating extensive greening were introduced into a school playground demonstrated increased numbers of students using greened areas and raised MVPA levels in the experimental but not the control school, with girls, especially increasing their time spent in VPA after the greening efforts (Raney et al, 2019). Van Dijk-Wesselius et al (2018), too, found evidence that greening of school playgrounds had some impact on girl's PA immediately after their intervention.

In a less extensive project, where a single school received a new running track, modest increases in MVPA were seen after 5 weeks which diminished again after 9 weeks and some increases in VPA only for boys which held at the 9 week measuring point (Powell et al, 2018). A process evaluation showed poor intervention fidelity and, that contrary to expectation, it was boys who utilised the track more as it seemed to spark their imagination for creative play.

2.4.4 SPACE

The need for adequate space to play is a common theme in qualitative work regarding school play times (Caro et al, 2016; Eskola et al, 2018; Hyndman and Telford, 2015; Martínez-Andrés et al, 2017; Pawlowski et al, 2014; Snow et al, 2019). Specifically, for girls, the provision of smaller, secluded areas have also been reported to be important for cultivating a sense of privacy and are preferred for socialising and playing even in larger playgrounds (Pawlowski et al, 2014). Pawlowski et al, 2019b also reported that girls who had less space per child in the playground, perceived the smaller space and felt crowded.

Some authors, too, (Ridgers et al, 2010a; Van Kann et al, 2016) have found that play space per child is positively associated with PA and Fairclough et al, (2012) found it to be a significant predictor of VPA during school time. Actual play area has also been found to be positively associated with recess PA (Escalante et al, 2012). No association between the size of play space and children's PA however, has been found in other work (Dalene et al, 2016; Nielsen et al, 2010; Nielsen et al, 2012; Van Sluijs et al, 2011) and a negative association in one study (Pereira et al, 2020). Harten et al (2008) found that play space per child had a positive association only with boys.

Three small intervention studies have explored how available space affects children's PA (See Table 2.2 for study characteristics). Allocation of play areas to different children at different times (Loucaides et al, 2009) or having split breaks (D'Haese et al, 2013), thus increasing play area per child are strategies which have successfully enabled children to engage in more MVPA during their playtimes. However, effects during recess time were reported by D'Haese et al to be only very small increases of 1 minute of MVPA and across the whole day, increases were only evident in boys. Significant differences in children's PA have also been seen when a play area was adapted using markers. Boys, in particular were more active when the area for play was larger (Harten et al, 2008).

2.4.5 TIME FOR PLAYTIME

A positive association has been found between number of playtime/outdoor minutes and playtime/outdoor PA by some researchers (Mantjes et al, 2012; Massey et al, 2018; Pagels et al 2014; Parrish et al, 2009b;) and Ridgers et al, (2007a; 2007b) described how, after their playground re-design project, the intervention effect was greater with provision of a longer playtime. Some researchers, too, have found that children engage in more MVPA during the lunch period than during other breaks (McKenzie et al, 2010; Zask et al, 2001), possibly due to its longer length. However, it has also been noted that as the length of outdoor time increases, the relative amount of MVPA correspondingly decreases (Pagels et al 2014; Parrish et al, 2009b). Where two morning breaks have been provided, instead of one, children have been observed to spend more time in MVPA overall (Kobel et al, 2015a) although with only one break, children spent proportionally more time in MVPA.

On the other hand, no significant differences in MVPA or sedentary behaviour were found in children who were given either two or three breaks in their school day (Ridgers et al, 2011; Ridgers and Stratton, 2005) or during longer breaks when assessed as total number of minutes for play (Van Sluijs et al, 2011). Conflicting results were also obtained when children's VPA increased as playtime length increased when measured by heart rate telemetry, but decreased when measured by accelerometer (Ridgers et al, 2010b).

2.4.6 GENERAL SCHOOL POLICIES

Inevitably, children operate within the confines of the particular school climate in which they play and exercise. Schools might have specific policies about how children should use their free time, ban certain games or remove free play as a consequence for poor behaviour (Huberty et al, 2012) and clothing restrictions or space controls may also be imposed (Parrish et al, 2012). Alternatively, PA may be given as a reward which has been identified as a correlate of MVPA by some researchers (Leatherdale et al, 2010).

In studies that have examined the link between school policy and pupils' PA, varying results have been found. Faulkner et al (2014) found a positive association between an elementary school having written policies for PA both during the school day and across the whole day. Daily PA has been reported to be positively associated with a 'school PA practices index,' (Carlson et al, 2013), with each additional practice being associated with 5.6 more minutes of school-time MVPA. The 5 item index comprised policy requiring 20 minutes of recess, recess being supervised by a non-class teacher with the student to supervisor ratio ≥ 75 students, the school having a PE teacher and providing weekly PE ≥ 100 minutes.

On the other hand, no association has been found between school policy aiming to increase PA and physical activity in other studies focussing on primary aged children (Taylor et al, 2011). Taylor et al measured school policy through a wide-ranging questionnaire looking at multiple policy types such as the provision of facilities before and after school, break-time, safety issues and the use of PA as reward or punishment and it might be that this spectrum of policies investigated as a single score could have resulted in the effect of specific, useful policies being missed.

Van Sluijs et al, (2011) reported a negative association between PA and having a written or informal school policy for improving PA and suggested that this might be because schools wishing to increase children's participation in sport activities might set up a policy. Children have also been found to engage in less MVPA at recess when their classroom teacher attended training for PE (Martin et al, 2012), perhaps due to teachers attending training if their pupils were not particularly active.

2.4.7 WEATHER POLICY

Pawlowski et al (2014) in a focus group exploration with children found that bad weather was viewed as a barrier to PA at playtime due to children disliking harsh conditions and being prevented from using their favourite equipment. If given choice, girls generally preferred to stay inside in rainy weather whilst some boys would choose to be active outside no matter what the conditions were like. School policies varied between preventing children from going out in bad weather, allowing children to choose whether they went out or not or offering access to a sports hall as an alternative to the playground. Both boys and girls liked being able to use indoor facilities. Children in another qualitative study thought that bright sunny days were conducive to outdoor play and that overcast and rainy or snowy days were also appealing as long as they had the right clothing (Eskola et al, 2018).

One investigation explored the interaction between school policy and weather conditions (Harrison et al, 2011). Accelerometer measures showed that when there was wet weather during the school day, children were significantly less active and more sedentary than on dry days. However, at schools where policy allowed children to be outside, even when it was raining, children were not as active as at those at schools which determined that children should stay indoors when it rained even where children could not choose to engage specifically in physical activities. Children who were allowed to be active inside spent 9.8 more minutes in MVPA over the lunch break and 18.7 minutes more across the whole day than children who played out in the rain.

Encouraging indoor activity in bad weather could be one way that a school could maintain PA levels even when conditions are not suitable outside although finding the space to do this might not be feasible as a PE hall might double up as a dining area. In the Harrison study, 86% schools which allowed indoor PA during wet playtimes had a second hall space compared with 60% of schools which did not allow indoor PA. This study recruited a large number of children and used objective methods for measuring PA and rainfall. However, rainfall measures were based on weather station data rather than from an assessment of whether it was actually raining during the measurement period. Van Sluijs et al, (2011) found that school policy allowing outdoor play in any kind of weather bore no relationship to PA. In hot conditions, providing shade might be thought to encourage more PA. Parrish et al (2009b) found that MVPA was higher, however, in unshaded areas, in the Australian schools they studied, perhaps because ball games were played more in the open areas and, in addition, shaded areas were more likely to have harder surfaces where children needed to be more careful to avoid injury.

2.4.8 PEER INFLUENCES

Effects of studies investigating the impact of using social strategies to facilitate children's PA and of studies which have investigated the association of social factors with children's PA are summarised in table 2.4. Children enjoy the company of their friends and peers during break times and this can foster an enjoyment of being active together (Caro et al, 2016; Powell et al, 2016; Martínez-Andrés et al, 2017) and create opportunities for play (Eskola et al, 2018). Children might engage in active pursuits simply because their friends are doing so (Parrish et al, 2012; Pawlowski et al, 2018). Peer support may buffer unwanted negative behaviours from others and give confidence that help is there if needed (Hyndman and Telford, 2015).

Conversely, forms of teasing and bullying might be inhibitive of PA as they prevent children from playing how and where they want (Hyndman and Telford, 2015; Parrish et al, 2012). Conflicts about what games to play, who is allowed to play and game rules are perceived to be other factors which prevent children from participating fully in active play (Martínez-Andrés et al, 2017; Pawlowski et al, 2014; Pawlowski et al, 2018). Arguments amongst boys are a common feature of ball games and boys' dominance of the football field often denies girls the opportunities they would like to play ball games themselves (Pawlowski et al, 2014).

Peer friendships and networks also appear to be influential in determining children's PA both inside and outside school (Ducheyne et al, 2012; Leatherdale et al, 2010; Salway et al, 2018; Stearns et al, 2019; Swanson et al, 2019) with children who report a higher number of friends who are active being more likely to be active themselves (Leatherdale et al, 2010; Swanson et al, 2019). Friends' encouragement (Ducheyne et al, 2012) has also been found to be a significant predictor of PA and Massey et al (2020) reported a postitive association between boy's MVPA levels and recess periods where high levels of pro-social behaviours were observed. Being part of large and medium groups can also be positively associated with boy's MVPA (Powell et al, 2016; Ridgers et al, 2011; Roberts et al, 2013; Woods et al, 2015) whereas girls have been seen to enjoy walking round or engaged in small friendship groups during their recreational time (Powell et al, 2016; Ridgers et al, 2011; Woods et al, 2015).

The effect of peer modelling materials together with rewards and pedometer target setting has been investigated in two small controlled trials (Hardman et al, 2011; Horne et al, 2009). Horne et al showed that when the intervention was implemented, involving all three behaviour change elements, children in the experimental group were significantly more active after the intervention period and a 26% increase in PA was sustained after 12 weeks in intervention girls. Hardman et al (2011) looked at the impact of presenting peer modelling and rewards separately as well as together in the full intervention. Whilst peer modelling and rewards together demonstrated greater benefits for children's PA than when peer modelling was offered alone, follow-up measurements after 13-14 weeks showed that the benefits only remained at the school which received the peer modelling element of the trial without rewards.

As an alternative strategy, Foote et al (2017) investigated the impact of an intervention designed to encourage co-operation and motivation to achieve a common goal. Children were invited to increase their class total of pedometer steps by 10% over a specified number of days in order to receive a reward. Results showed that children increased their PA during the course of the intervention with the effect quickly falling when the challenge ended. A similar game approach was used in a small study in which children were divided into teams and encouraged to amass pedometer steps for their team in order to win a reward (Galbraith and Normand, 2017). Children accumulated more pedometer-recorded steps during break-times with the game than without. Characteristics of these studies are shown in Table 2.2.

2.4.9 ADULT SUPPORT AND ENCOURAGEMENT

Adult support may be important for maintaining safety and harmony in the school playground thus providing an environment conducive to being active (Hyndman and Telford, 2015; Parrish et al, 2012; Pawlowski et al, 2014). Children have expressed their liking for adult input at break time, especially when that involvement is from play leaders or coaches who are not the usual teachers or lunchtime supervisors (Powell et al, 2016). Adults have also been seen as important for dealing with injuries, sorting out equipment and helping with conflict (Caro et al, 2016; Martínez-Andrés et al, 2017). However, some children have also thought that tight regulation of leisure time by teachers might restrict active behaviours (Caro et al, 2016; Eskola et al, 2018; Hyndman and Telford, 2015).

Adult presence and active adult engagement in the playground have been seen to be positive predictors of PA at break times (Chin and Ludwig, 2013; Massey et al, 2018; Van Kann et al, 2016; Willenberg et al, 2010). Massey et al, (2020) observed that when there were higher levels of adult supervision in the playground, the gap between boy's and girl's levels of PA was narrowed, suggesting that adult presence is important for ensuring that all children access opportunities to be active during leisure times. Social modelling may also be influential in encouraging active behaviours. Children who attended schools with a physically active PE co-ordinator were more active themselves in one Australian study (Martin et al, 2012).

Factor	Intervention Studies + positive, - negative. 0 no effect of intervention **Bold indicates large CRCT**												Observational Studies + effect of factor, - negative effect of factor 0 effect of factor on PA																Qualitative Studies + facilitator of PA - barrier to PA							
	Horne, 2009	Hardman, 2011	Foote, 2017	Galbraith, 2017	Bleeker, 2015	Beyler, 2014	Yildirim, 2014	Dudley, 2018a	Efrat, 2013	Ernst and Pangrazi, 1999	Pangrazi, 2003	Taylor, 2018	Ducheyne, 2012	Leatherdale, 2010	Salway, 2018	Stearns, 2019	Swanson, 2019	Massey, 2020	McKenzie, 2010	Ridgers, 2010a	Zask, 2001	Carlson, 2013	Martin, 2012	Parrish, 2009b	Willenberg, 2010	Van Kann, 2016	Massey, 2018	Chin and Ludwig, 2013	Caro, 2016	Eskola, 2018	Pawlowski, 2018	Powell, 2016	Pawlowski, 2014	Martínez-Andrés 2017	Hyndman, 2015	Parrish, 2012
peer modelling	+	+																																		
peer company/influence/ friends													+	+	+	+	+	+											+	+	+	+				
conflicts/anti-social behaviour																													-	-	-		-	-	-	-
social prompting									+																											
social modelling									-																											
gamification			+	+																																
specialist staff/ pupil training												0											-													
adult supervision																			-	0	0	-		-					-	-				-	-	
adult presence/support/ encouragement					**+**	**0 +**	**-**			+	+												+	0	+	+	+	+	+			+	+	+	+	+
multicomponent with social elements								**+**																												

Table 2.4: School factors studied/identified in qualitative, observational and interventional studies investigating social factors

Where children are supervised more heavily during their playtimes, on the other hand some researchers have noted a corresponding lower level of PA (Carlson et al, 2013; McKenzie et al, 2010; Parrish et al, 2009b), with girls being less likely to be active in playgrounds where organised activities are taking place (McKenzie et al, 2010). However, no relationship between levels of supervision on the playground and children's PA either when adults did (Zask et al, 2001) or did not intervene (Ridgers et al, 2010a) in children's games has also been observed.

Through a cluster RCT, adult promotion of children's PA through supervising organised games and developing co-operation and conflict management skills in the players (Bleeker et al, 2015) was found to have an impact on girls' PA, with girls in the intervention schools registering a 34% increase in high intensity accelerometer counts per minute and spending more time in VPA at break times than girls at control schools. From additional SOPLAY observations, it could be seen that girls who experienced the intervention also engaged in more energetic running games and jumping during playtimes than girls who did not receive the intervention. Strengths of this study included the cluster RCT design involving selection from SES matched groups of schools in order to limit systematic differences, the use of both accelerometer and SOPLAY for measuring PA, high level of reliability in the observations between raters, detailed description of accelerometer protocol and a 1 year implementation period for the program. An earlier cluster RCT evaluation of the intervention, however, found no significant impact of the program on time spent in MVPA at recess as measured by accelerometer or pupil report. Only teacher reports suggested that there had been any changes after a year of the intervention (Beyler et al, 2014).

Dudley et al, 2018a offered training to teachers in games strategies and supporting social skills development, training for children to become sports' ambassadors and provision of line markings and supporting equipment as components of a multi-faceted cluster randomised trial which was successful in decreasing sedentary behaviour and increasing VPA during break times. Good inter-rater reliability was demonstrated on an observational rating scale, giving some confidence in the observed behaviours and there was some consistency in findings across the 4 schools in the study. However, it is difficult to determine, from the presented results, which individual elements of the programme contributed to the positive PA outcome. Despite the helpful changes as a result of the intervention, no increase in social support was reported by children from baseline to follow-up through a short self-report measure for noting instances of encouragement from teachers or other children. It is possible that this could be because children did not accurately recall their sources of social support for PA over time. The authors did not make clear exactly what the time frame was between children taking part in the intervention and responding to the questionnaire.

A combination of education, provision of sport's resources and encouragement from teachers has also had some success in raising children's PA (Yildirim et al, 2014) although an increase in perceived social support from teachers seemed to suppress the intervention effect for LPA at break time (Yildirim et al, 2014). Social prompting has also found to be successful for increasing children's MVPA by 2.41 minutes during break time in a small cluster randomised intervention in which children were reminded of the benefits of exercise (Efrat et al, 2013). However, comparison group MVPA also increased after the trial period so it was not clear how much of the intervention effect could actually be attributed to the social prompting. In a third group, MVPA decreased after a social modelling strategy was used.

Other successful strategies of school trials involving an element of adult intervention have included teacher prompting, guidance, participation in activities and support for students to take responsibility for their own levels of activity (Ernst and Pangrazi, 1999; Pangrazi et al, 2003). Boys and girls receiving this input accumulated more PA than those in control groups and girls, especially were found to benefit (Pangrazi et al, 2003) and reported an increased attraction to PA after receiving the intervention (Ernst and Pangrazi, 1999).

Specialist training for break-time supervisory staff, in which adults learned how to encourage all children to participate in PA and how to support older children acting in the role of play leader, was not found to raise children's MVPA (Taylor et al, 2018). Through semi-structured interviews, the researchers discovered that supervisory staff had had some difficulties in engaging older children in the new games, believing them to want their own independence.

2.5 SUMMARY

Schools might potentially influence children's PA in the outdoor arena through outdoor learning activities, promotion of active transport, provision of resources and policy development. In terms of learning outside the classroom, (Section 2.1) this literature review identified several small observational studies and a larger quasi-experimental trial which indicated that a forest school approach, taking learning into natural spaces, could, perhaps be utilised for increasing levels of children's PA. Cluster-randomised, controlled studies are now needed to assess these benefits more rigorously. The daily mile initiative has also shown some promise as a strategy for promoting children's PA although preliminary findings are not conclusive. The protocol for a large, longitudinal, quasi-experimental cohort trial which will objectively measure MVPA annually in London school children between Year 1 (5-6 years) and Year 6 (10-11 years) in order to investigate the impact of the Daily Mile has recently been published (Ram et al, 2021). Findings from this type of study might help to clarify the value of daily running activities for primary aged children in terms of their PA levels. Multiple opportunities exist in a primary school framework for taking curriculum learning into the school grounds and some aspects, such as utilising the playground for maths or school gardens for science have had positive effects on children's active behaviours. With the potential to raise children's PA levels whilst keeping curriculum time intact, further work is needed to identify what subjects work well in the outdoor environment and how this kind of teaching and learning can be integrated into the school year.

Children's active transport to school (Section 2.2) might be another facet of the school day that could be supported by school policies and drives and several studies have been described in this review which have aimed to promote PA through school-based ATS interventions using diverse means such as WSB or multi-faceted, whole community approaches although simple interventions have also been shown to be as effective for increasing ATS. As a newer line of enquiry, researchers have begun to look more closely at how to make the journey itself into a trip that children find pleasurable through incorporating game elements and utilising social engagement strategies. Most have been preliminary investigations, characterised by small sample sizes, thus limiting generalisability and subjective data collection methods which are prone to problems with recall and response bias. Some evidence was seen that WSB strategies might successfully increase children's daily PA through the use of objective measurement of PA and long-term follow-up. However, there is still limited evidence about what the school's role can be in promoting ATS.

When considering the impact of school resource provision and policies on PA in the outdoor environment, there is some evidence from across the board that loose play equipment, in particular, could be a valuable resource to offer in the playground. Several small intervention studies as well as three larger cluster RCTs have corroborated findings from observational studies and qualitative work which indicate that children are more active when they have small items of equipment available during break times, although increases in activity are small. Providing 'loose parts' for the playground to encourage social and creative play has been shown to be a promising strategy for increasing PA levels in younger aged primary children in cluster RCTs and there is some evidence of sustained PA benefits for older children. Future studies could explore further how children across the primary age range can benefit from this kind of input. Line markings and zoning for games with/without the provision of additional play equipment have been studied frequently in experimental work, including through some controlled trials which could be considered to be large as defined by Parrish et al (2013) as they have 250 participants or more. Findings are not consistent, however, and more evidence is needed to demonstrate that simple strategies such as these are of value for promoting children's PA, particularly over time.

Mixed effects were found in studies that have aimed to investigate characteristics of the school landscape and school policies for encouraging children's PA with the majority of studies being observational. While some have suggested that aspects of re-design or 'greening' of school grounds might facilitate PA, others have found that these changes or differences only attract some children or show no association with PA. Interventional designs could help to substantiate this work although the small number of interventional studies investigating school design could be a result of financial and logistical constraints involved with changing school environments on a large scale. Two large cluster RCTs which made large landscape changes in school grounds found no effect of those alterations and discrepant results were also seen between two large controlled trials that investigated children's PA after their school yards had been greened. School policies such as length of breaks or how space is made available lend themselves more easily to investigation although they have not, as yet, been extensively tested through experimental trials and observational evidence is inconclusive. School policy at a practical, day-to-day level seems to have been studied to a lesser extent and questions, for example, relating to clothing for outdoor pursuits, discipline policies, access to equipment at different points in the day and storage of equipment are not often evident in the literature although they may be pertinent.

There is some consistency in findings across studies that peer support/friendship and adult encouragement might have the potential to facilitate children's active behaviours and that conflict in the playground and strict supervision might be detrimental to children's PA. However, the evidence is, nonetheless mixed even in the studies presenting the strongest methodological designs. Overall, whilst some factors have been thought to be important in qualitative work, or demonstrated to be associated with children's PA there are fewer intervention studies which have been undertaken to clarify these relationships and these vary considerably in their focus, methods and size so that it is difficult to bring together the strands to create definite conclusions about the efficacy of any one strategy. Children do not always benefit from changes that are made and effects of provision on PA are not always equal between groups.

Randomised, controlled designs and long-term follow-up are needed to assess the value of school factors relating to children's active behaviour, with PA being measured across the whole day as well as during school hours. Intervention studies could also be designed to investigate single components so that their benefits could be established for inclusion in multi-component trials, as concluded, too, by other reviewers (Parrish et al, 2013; Parrish et al, 2020). In particular, the role that adults play in facilitating children's PA is an area which could be elucidated further and the type of support that children can provide for each other. The nature and value of school policies aiming to encourage children to be more active also need to be determined. There is a need for more qualitative work across the board to provide insight into the barriers experienced by children which prevent them from fully engaging with facilities in the school outdoor environment and to shed light on school ethos, organisation and features which enable them to be active.

CHAPTER 3

FOCUS GROUP OR INDIVIDUAL INTERVIEWS FOR EXPLORING CHILDREN'S HEALTH BEHAVIOUR: THE EXAMPLE OF PHYSICAL ACTIVITY

3.1 INTRODUCTION

As discussed in Chapter 1, schools are thought to be well placed to offer a wide range of opportunities to young people, which might enable them to achieve higher levels of PA. It has been shown that schools differ in the amount of PA that their pupils engage in and, although, as detailed in Chapter 2, there has been some study of the school factors which contribute to that effect, there is currently insufficient evidence on which to base firm guidance for UK schools about what constitutes a good intervention.

With the growing awareness that children might provide valuable insights into their own worlds, and the legislative background which gives them the right to have their opinions known, there is a need to ensure that they are given opportunities to express their thoughts and to contribute to knowledge through research endeavours (See Chapter 1, section 1.6). In the current chapter, two methods for working with children, the individual interview and the focus group interview, are compared with a view to assessing their suitability for accessing children's ideas about how school supports their PA in the outdoor environment .

A quantitative content analysis and interpretation was undertaken to identify differences between the two methods and the data were investigated assuming the stance taken by critical realism (Section 1.6.3) that reality can be conceptualized in terms of three layers, the empirical , the actual and the real. Within this framework, data collection and analysis at an empirical level, as in this content analysis, might illuminate observable patterns/demi-regularities which could exist in a structured way. These patterns could, potentially, shed light on underlying structures or mechanisms operating at the 'actual' or 'real' levels (Saunders et al, 2009) and therefore suggest possibilities for further investigation. Whilst the two methods of focus group or individual interview rest within a qualitative, interpretivist tradition, as described in Chapter 1 (Section 1.7.1), the data that are collected are not necessarily aligned with any one particular paradigmatic stance (Howe, 1988; Trochim, 2006) which render them suitable for analysis by any relevant means. By analysing the verbal output through a numerical coding process, similarities and differences between the methods could be explored and some tentative conclusions drawn about whether any patterns existed. A qualitative examination and analysis of the data was also performed and its findings were used to gain more understanding of what might be operating 'below the surface' in the particular circumstances of this study. Whilst this is not presented, in full, in this chapter, some of its findings are used to develop points in the discussion.

3.2 BACKGROUND

Qualitative methods have been used increasingly to explore issues with young people (Gibson, 2012; Irwin and Johnson, 2005) and, unlike responding to researchers' closed questions in a questionnaire, allow children to talk more freely, in their own words about their perceptions of and feelings towards a particular issue. Important content and themes may be elicited which might not have been obvious from the literature or known to adult 'experts'. A variety of health-related topics have been examined in this way (Gill et al, 2008b; Kortesluona et al, 2003; Morgan et al, 2002), including research about PA through focus groups (Darbyshire et al, 2005; Pawlawski et al, 2014; Willenberg et al, 2010) and paired interviews (Parrish et al, 2012).

Focus groups are widely used with children for a variety of research purposes (Heary and Hennessey, 2002) although their relative advantages and disadvantages compared with individual interviews are not entirely clear. There is little consideration in the literature of why one particular method is chosen over another with authors only sometimes stating reasons for their method of choice although not their reasons for discounting another technique. Where qualitative data collection methods are to be used to explore children's perceptions of health behaviours, the choice of approach may be an important consideration due to specific research constraints and depending on the nature of information that is sought.

3.2.1 COMPARING FOCUS GROUPS AND INDIVIDUAL INTERVIEWS

Some researchers have compared descriptively the use of focus groups and interviews with children and have found each method to have particular strengths. Interviews may, for example, be a good forum for talking about difficult or sensitive issues (Michel, 1999) whilst focus groups can be useful for accessing shared perspectives, (Michel, 1999; Porcellato et al, 2002). A more formal comparison was undertaken by Heary and Hennessey (2006) who found that children's experiences of working in the two different ways were similar although more relevant and unique ideas were produced about the causes of ADHD by means of individual interview and a greater elaboration of ideas was reported from the focus group discussions. However, as part of the definition of 'elaboration' included the idea of adding in some way to another person's contribution, it is evident that this element could not have been assessed through individual interview and did not enable a clear comparison to be made. While transcript segments revealed that children could support each other during focus group discussions to facilitate elaboration, the level of elaboration that could be elicited by a skilled interviewer in individual interviews for example, was not explored.

When data collection methods have been compared with adult participants, interviews have been reported to be the most useful method for raising more ideas in some studies (Fern, 1982; Guest et al, 2017; Rat et al, 2007) although others conclude that concepts are more likely to be raised during focus groups (Thomas et al, 1995). This work highlights that research methods are not equivalent and need to be selected carefully for a particular purpose. This present study was conducted in order to explore the strengths and limitations of using a focus group method for collecting data about children's perceptions of PA in a school setting as compared to using individual semi-structured interviews. Specific issues were the feasibility of the two methods in a school setting, the quality and quantity of children's contributions and the number of novel contributions generated which could be used to inform survey development.

3.3 METHODS

3.3.1 PARTICIPANTS

One state primary school in the East Midlands region of the UK, chosen for reasons of convenience, was approached and agreed to take part in the study. Study information was sent home to the parents of all 78 children in three Year 6 classes together with opt-out consent forms. Stratified randomization, using a random number generator, was used to allocate six children to the 'interview' group condition and six to the 'focus' group condition from all the consenting children. Three boys and three girls participated in each group. All participants gave verbal and written informed consent. The study was given ethical approval by the Faculty of Medicine and Health Sciences Research Ethics Committee at the University of Nottingham (Ref: B14052015 SoM ROD; Appendix 1)

3.3.2 PROCEDURE

It was randomly decided through the toss of a coin that the focus group would be conducted before the interviews. The focus group took place in the morning in an empty classroom where the selected children met the researcher (KW). After the consent process, participants were asked questions according to a prepared schedule (Table 3.1). When the group found it difficult to offer new opinions and ideas, additional prompting (based on Table 3.2) was used to encourage children to elaborate further.

Introductions/confidentiality/consent/ice-breaking activities (focus group)
'I am interested in finding out about how schools including your school can help you to be active in outside spaces and what might stop you from being active. I really want to hear all of your views. There aren't any 'right' or 'wrong' answers. I might ask you some more about a point that you make as it could be particularly useful.' 1. To begin with, please could you tell me what and who would be in your perfect play space at school if you could have any design and any people that you wanted. 2. What and who would not be in it? 3. Thinking about your own playground now, what kinds of things help you to be active? 4. Is there anything that stops you from being active? 5. Picture Activity. Thank you

Table 3.1: Focus Group and Interview Schedule

A photo ordering task was introduced later during the session for which twenty A5 sized photographs, depicting a variety of equipment, spaces, people and signs which might be found in a school's outdoor environment, were placed on the floor (Figure 3.1). Photographs, in this context, provided an additional channel for communication between the researcher and child, allowing the researcher an alternative frame for questioning (Clark-Ibáñez, 2004) and acting as a '*tangible prop'* (Clark, 1999, P.44) which might have helped children to recall and organise memories and ideas and to put them into words (Zartler, 2014). Children were asked to work as a group to order the pictures according to how they thought the images might encourage them to be active. The resulting line of photos was then used as the basis for more discussion as children were asked to explain their reasons for placing the pictures in that particular order.

Physical Environment

- Are there any particular pieces of equipment which encourage you to move around more?

If yes: What is it about that which encourages you to move around more?
If no: What would you like which might encourage you to move around more?

- Are there any particular parts of the playground/school grounds where you move around more?
- What is it there that encourages you to move around more?
- Is there anything in the playground/school grounds which puts you off moving around more?
- How do you travel to and from school?

If active: Are there any ways that the school makes that easier/harder for you?
If passive: Is there anything the school could do/does/could stop doing to encourage you to walk/cycle/scooter to school?

Policy Environment

- Are there any rules that you have here in your school which encourage you to move around more?
- Are there any rules that you have here in your school which might put people off or stop people moving around more?
- Do all children play out at the same time at playtimes?

Does that work well to help children to get moving around?

- Is there anything which stops children from going out to play?
- How many adults are usually out with you at playtimes/lunchtimes?
- Are you allowed to play on the playground before/after school?

What kind of rules are there about that?

- Do you have any lessons outside?

Table 3.2: Additional Prompts prepared for use during Focus group and Individual Interviews

Individual interviews took place in the same room in the afternoon and each child was taken through the consent process separately and asked questions according to a prepared schedule (Table 3.1). A number of prompts were prepared to help the child to respond more fully (Table 3.2). The same twenty A5 photographs were used as above to stimulate further discussion with KW.

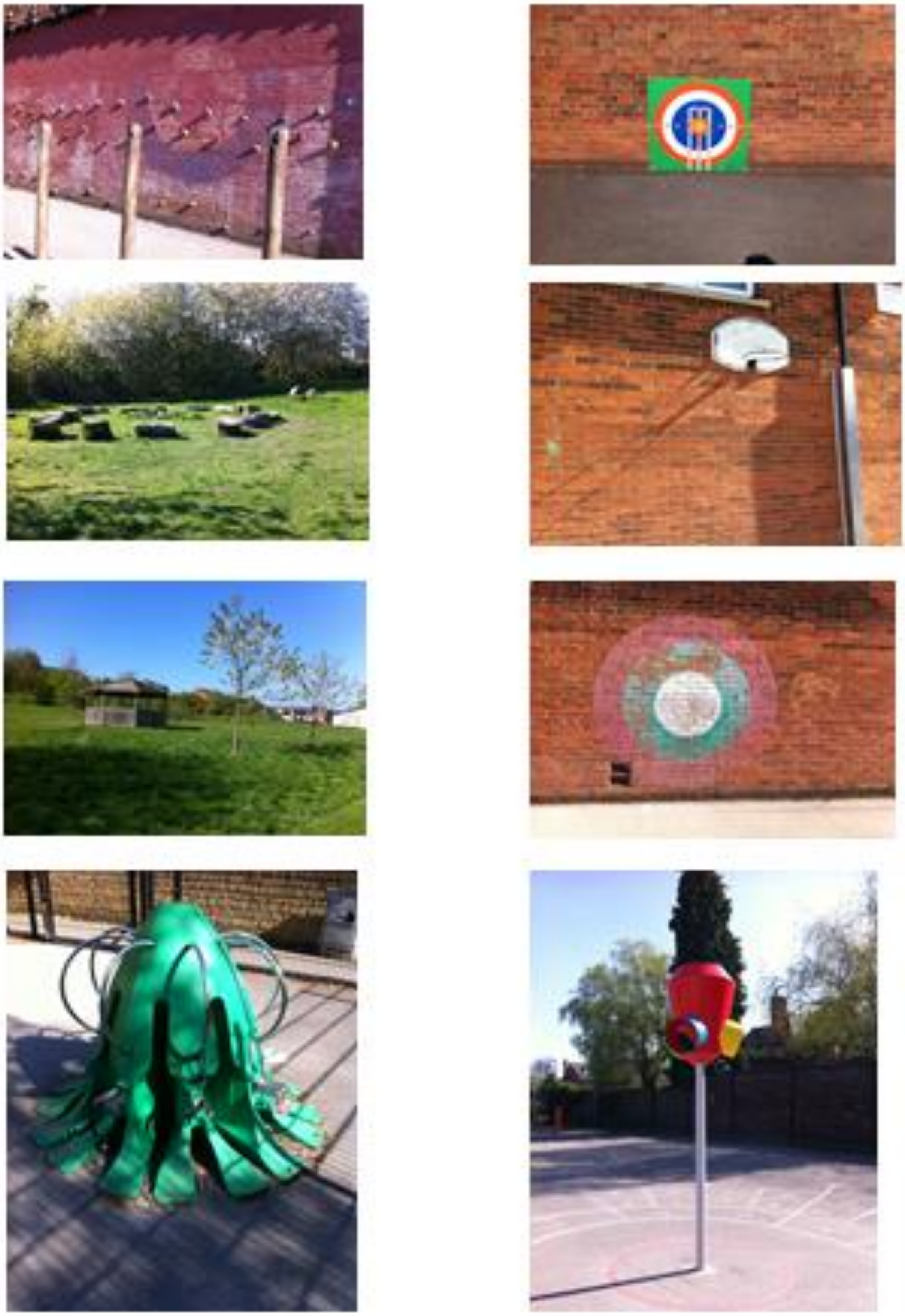


Figure 3.1: Example pictures for child interviews presented as A5 images

3.3.3 CODING AND ANALYSIS OF DATA

The data were examined in two ways. Firstly, themes were identified and coded (Boyatzis, 1998; Braun and Clarke, 2006) in an exploratory, descriptive analysis. Secondly, the data were transformed to a numerical form through a process of content analysis (Carley, 1993; Bowen and Bowen, 2007) and subsequently analysed statistically (Carley, 1993; Bowen and Bowen, 2007). This integrated mixed-method design (Srnka and Koeszegi, 2007) allows for both the production of numerical data which can be analysed quantitatively (the present study) as well as qualitative themes and description for deeper understanding of wider research questions.

Verbatim transcripts of the individual interviews and the focus group formed the data for coding and analysis. Pseudonyms were used to ensure anonymity of participants. Data analysis was concerned with establishing whether there were any differences between the focus group and individual interviews in terms of how engaged the children were in discussion and in the type and number of responses that were obtained by each method. Four analyses were conducted. In Analysis 1, the total number of words and total number of separate spoken occasions were counted for each child in the interview setting and the focus group as a measure of children's participation in the research process. In Analysis 2, the number of facilitators/potential facilitators of PA and barriers/potential barriers to PA raised, affirmed or spoken about by each child in the two discussion settings were identified (discrete facilitators/barriers). Analysis 3 then re-examined each child's list of named facilitators and barriers, removing any from an individual's list if it had previously been mentioned by another child, earlier in the process (unique facilitators/barriers). In this way, the total number of unique facilitators and barriers contributed by the interviews and the focus group could be ascertained. Analysis 4 was concerned with identifying how many times each individual mentioned particular facilitators or barriers and out of those times, how often were those facilitators and barriers personally applicable or relevant. The facilitators and barriers presented were subsequently grouped into categories based on relevant literature and the exploratory descriptive analysis to reduce the data to a more comprehensible size due to the large number of possibilities suggested by the children. Ideas that were not relevant to the research question were not included in the analysis.

Examples of transcript segments coded according to the described analyses are shown in Table 3.3.

Mann-Whitney U tests were used to determine whether there were any statistically significant differences between the focus group and individual interviews in terms of the number of words spoken, number of spoken occasions, number of discrete and unique facilitators and barriers and how often facilitators and barriers were mentioned and noted as personally relevant.

Conducting research with children in a school environment can be challenging for a number of practical reasons and so practical issues concerned with holding a focus group and individual interviews in a school setting were also identified in order to examine how the data might be collected with minimum disruption to the school whilst being a positive experience for the children involved and suitable within the limitations of a research framework.

The coding for facilitator/barrier presence and frequency was checked by a second researcher on a 20% sample of the transcripts and inter-rater reliability established for Analysis 2 and Analysis 4.

<table>
<tr><td>Analysis 1: Total Number of Words/ Number of Spoken Occasions

Edie: Like a circuit, like different activities that you go round.
KW: So, a circuit. What kinds of activities would be on the circuit?
Edie: Like skipping and running to somewhere and like doing different...
Kieran: Basketball, Boxing.
Connor: That’s unsafe.</td><td>Word Count
Edie: 20, Kieran: 2
Connor: 2
Spoken Occasion Count
Edie: 2, Kieran: 1
Connor: 1</td></tr>
<tr><td>Analysis 2: Number of Facilitators and Barriers raised/mentioned by each individual

KW: If you could design a perfect play space at school in the playground, what would you have in it and who would you have in it?
Kate: Well, I would have a big park with slides and I would have a few teachers and lots of children.</td><td>
Potential Facilitators raised as part of perfect play space discussion: 4</td></tr>
<tr><td>KW: So you like the look of the playground markings?
Thomas: Yeah, cos it’s like stuff you can do rather than just sitting around.</td><td>Facilitator affirmed as part of pictures discussion.</td></tr>
<tr><td>KW: What happens if you don’t have your PE kit at school?
Kieran: Can’t play.
Alice: You can’t do it.......You have to sit out.</td><td>Policy barrier spoken about by Kieran and Alice.</td></tr>
<tr><td>Analysis 3: Number of Unique Facilitators and Barriers raised by each group

KW: ...are there any particular parts of your playground that really encourage you to want to be more active than any others?
Kate: Yeah, um, there is....the climbing frame.

KW: ....so thinking about your own playground now, are there any things in your playground that really, really encourage you to be active?

Sian: Climbing frame.</td><td>Kate mentions the climbing frame as a facilitator as part of her interview.
In a later interview, Sian mentions the climbing frame. This is not counted as an additional unique factor for the interview group and is deleted from the facilitators listed by Sian.</td></tr>
<tr><td>Analysis 4: Number of times particular Facilitator or Barrier mentioned

Connor: Well, on like some days only some people can play football and only some people can play basketball like some people can play like on equipment like say year 3s and year 4s at Monday are playing football and year 5 and 6 can’t play football. Then Monday there’s no football and no basketball and no stuff....</td><td>Football, basketball and [loose] equipment talked about on this occasion in same context therefore only counted once each.</td></tr>
<tr><td>Analysis 4: Number of times particular Facilitator or Barrier mentioned and acknowledged as liked or undertaken.

KW: Mmm. Do you ever do those [previously mentioned] games?
Kenny: Er….nah. I’m normally playing football or bulldog or something like that.
KW: That sounds like you like really kind of quite heavy active games.
Kenny: Yeah. I like like ball… any ball games pretty much.</td><td>Football, bulldog and 'ball games' mentioned.
Kenny states that he actually plays football and bulldog so both are personally applicable.
Kenny states that he likes ball games so it is personally applicable.</td></tr>
<tr><td>Example of contribution not relevant to research question

Kay: If people follow the rules..... Do you think people generally do follow the rules?
Connor: Most people but like some people like when people want to go to the toilets, everyone like shuts the doors when they’re going to the toilets but they’re actually not.</td><td></td></tr>
</table>

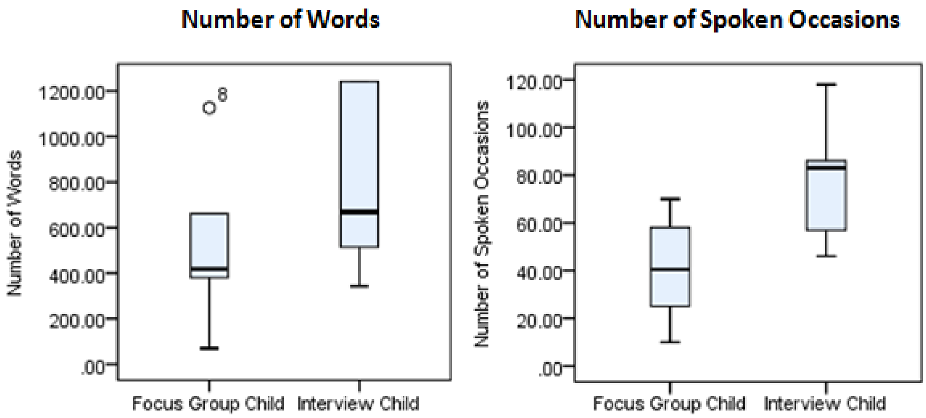
Table 3.3: Examples of transcript coding

3.4 RESULTS

Two children (2.5%) returned opt-out forms. Three boys and three girls (mean age 11 years 6 months) participated in the focus group and three boys and three girls (mean age 11 years 6 months) were interviewed separately. The focus group lasted 56 minutes and mean length of interview was 12.2 minutes (range 8.5 minutes to 13.6 minutes) giving a total of 73.3 minutes of interview recordings. The consent process for each interview lasted (in addition to above interview length) between 5 and 10 minutes, and 20 minutes for the focus group.

Inter-rater reliability was established as 71% for facilitator/barrier presence and frequency in Analysis 2, 79% for frequency of concepts mentioned in Analysis 4 and 70% for frequency that concepts were described as actually facilitative or inhibitive in Analysis 4. These values fall within the threshold of 70% agreement recommended by Boyatzis (1998) and discussed by Campbell et al (2013) as being acceptable.

Results of Analysis 1 are shown in Figure 3.2. It can be seen that the range of words spoken was wider in the focus group, with the least talkative member speaking only 70 words during the session compared with 343 words spoken by the quietest child in interviews.



p=0.240 *p=0.041*

Figure 3.2: Box Plots of Number of Words Spoken and Number of Spoken Occasions for Focus Group and Interview Children

Children in the interview group spoke on significantly more occasions (*p=0.041*) than children in the focus group. Focus group and interview group children's individual spoken occasion counts are shown in Figure 3.3. In the focus group, the child contributing least spoke on only 10 occasions during the discussion time compared with 46 for the quietest child being interviewed.

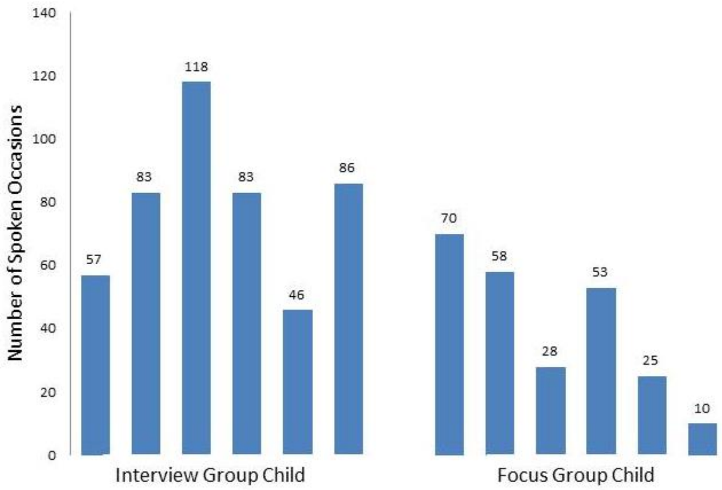


Figure 3.3 Number of spoken occasions for children in the interview and focus groups.

Spoken occasion counts were similar during individual interviews for girls and boys as shown in Table 3.4. In the focus group, however, boys spoke on more than twice as many occasions as girls.

	Median number of spoken occasions (girls)	Median number of spoken occasions (boys)
Interview group	83	86
Focus group	25	58

Table 3.4 Median number of spoken occasions for girls and boys in focus and interview groups

In Analyses 2 and 3, the differences between the focus group and individual interviews in the numbers of discrete and unique facilitators and barriers generated were examined (Figure 3.4). Children in the interviews talked about facilitators more than children in the focus group (*p=0.004*), although there was very little difference in the absolute numbers of barriers spoken about in the two discussion settings. When duplicate items were removed to produce measures of 'unique' facilitators and barriers, 102 unique concepts (67 facilitators and 35 barriers) were generated by the interview group compared with 65 in the focus group (42 facilitators and 23 barriers) However, the difference between the two groups in terms of total numbers of facilitators and barriers generated was not found to be statistically significant (*p=0.093*).

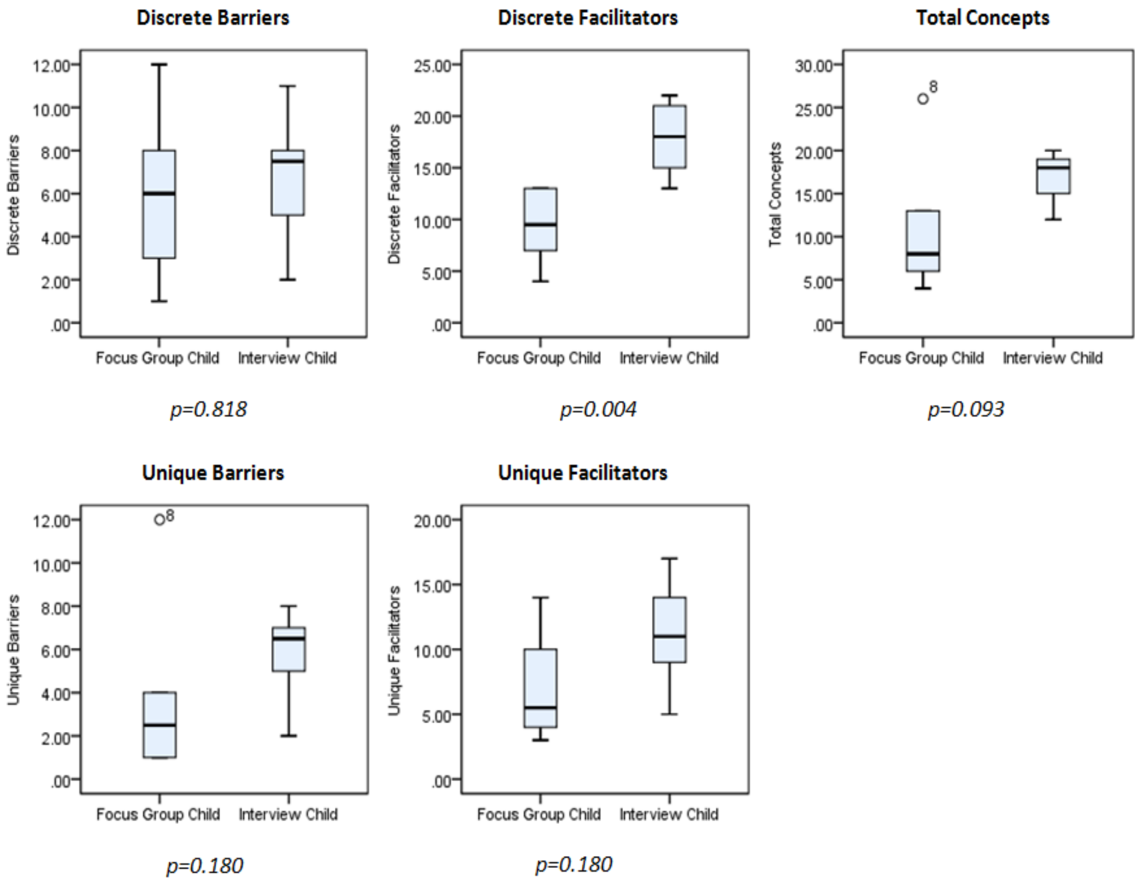


Figure 3.4: Box Plots of Discrete, Unique and Total Concepts for Focus Group and Interview Children

In the final analysis 4, the number of times particular types of facilitators or barriers were mentioned or described as personally applicable was counted (Table 3.5). Potential social factors which might influence PA were talked about significantly more often by children in individual interviews than in the focus group (*p=0.009*) and the number of times that fixed equipment items were mentioned was greater in the interviews *(p=0.041*) as well as equipment items that were actually facilitative (*p=0.015*). Activity factors, team games and school features were topics which were also frequently mentioned by children in the focus group and interviews (Table 3.5). The interview group raised items as being personally facilitative significantly more times than did the focus group *(Interview Median =11.5, Focus Group Median = 2.5, p=0.009).*

	Frequency of factors mentioned		p
	Interview group Median (range) Focus group	**Median (range)**	
Policy factors	3.0 (0-4)	2.0 (0-3)	0.310
Social factors	6.0 (4-7)	2.5 (0-5) *	0.009
Activities	7.0 (3-8)	4.0 (1-7)	0.699
Team games	5.5 (0-10)	5.5 (0-15)	0.699
School features	6.5 (1-13)	5.0 (1-11)	0.818
Fixed equipment items	5.0 (2-9)	2.0 (0-5) *	0.041

Table 3.5 Frequency of factors mentioned by interview group and focus group

While both the focus group and individual interview group made many similar suggestions about factors that might facilitate or inhibit children's levels of PA, some ideas were unique only to one of the groups. These are shown in Table 3.6. In terms of mentioning social factors, encouragement by friends was thought overall to be important for children's PA by both groups. Whilst children in the interviews described how Play leaders encouraged active play at lunch breaks, however, Play leaders were not discussed by the focus group. The interview group also suggested that a bench for making friends would be a useful fixture in the playground and mentioned the value of team games and creating dance routines with friends. As a barrier, one child in the interview spoke about their enjoyment of sitting and chatting with friends. In contrast, a focus group child talked about other children getting in their way. It was only in the focus group, too, that discouragement by teachers was thought to be a potential barrier to children being active. In the focus group only, imaginative ideas were suggested for equipment which could be provided in an ideal space such as Avatar costumes and futurised boots. The idea of a play wall was also suggested, a healthy eating cafe and an obstacle course. However, it was through the individual interviews that a wider range of equipment was discussed and included fixed play features such as climbing frames and basketball hoops, trampolines, water fountains and benches which were not mentioned by the focus group. Climbing was only mentioned in the focus group through the concept of climbing trees. Quiet spaces and activities were thought to be desirable in the playground by some of the children who were interviewed as well as after-school clubs and the chance to play on the playground before and after school. Interviewed children also considered benefits of equipment and games for different groups of children.

	Focus Group	Interview Group
Facilitators unique to group	obstacle course circuit netball climbing trees boxing play wall go-karts new looking equipment tarmac for stable equipment good games choice in PE creative ideas/avatars/futurised boots healthy eating cafe	water fountain benches ball games basketball hoop bulldog letter shape game racing catch hockey baseball hopscotch for younger children dodgeball cartwheels wall to contain football climbing frame/wall trampolines hula hoops create dance routines with friends play leaders bench for making friends team games bikes bikeability after school clubs time to play on playground before and after school
Barriers unique to the group	old, faded target unappealing equipment adult telling child not to do something other people in the way drains are trip hazard not allowed on grass football pitch takes whole space flooding in drains some aspects of PE boring and repetitive no footballs out after rain	enjoys sitting round chatting with friends quiet area with benches field is cause of hayfever equipment that is not used much no spaces left in after school clubs climbing wall/frame too small not many playground markings playground markings don't appeal any more using wooded area for quiet area using field for lying down and sunbathing climbing frame crowded only one water fountain painted nets too small games are sometimes banned

Table 3.6: Ideas about facilitators and barriers unique to focus and interview groups

3.5 DISCUSSION

The results of this study indicated that, whilst both focus groups and individual interviews can be suitable methods for collecting information about health behaviours from children, in this case, physical activity, interviews may offer some advantages over focus groups in terms of item generation.Despite the very small sample sizes, it was found that using interviews to explore children's perceptions produced significantly more contributions, identified more facilitators for PA and produced more personally relevant contributions compared to focus groups. Children in the focus groups spoke fewer words on average and identified fewer unique factors.

The findings suggest firstly, that the interview situation may be one which better facilitates participation for all children, whether confident or shy as indicated by the higher 'spoken occasion' counts in the individual interviews. Even the most reticent child offered over four times as many contributions to the discussions compared with the quietest child in the focus group. Previous work has also suggested that shy children might feel more at ease and contribute more in individual interviews (Hill et al, 1996) although others propose that a shy child could feel supported by peers in a focus group and thus enabled to speak (Hennessey and Heary, 2005; Mayall, 2000). When asked which she would prefer to take part in, the quietest child, 'Gwenan', who contributed least to the discussion stated a preference for a group. Some of her responses indicated how she 'hid' behind her friend, 'Edie' as in these extracts:

KW:	So you do use the markings that are on the floor a little bit?
Edie:	Yes.
KW:	And what about you Gwenan?
Gwenan:	I do the same.
KW:	Yeah. What about you Edie, do you have any lessons outside?
Edie:	Not really, no. We just stay inside unless it's like a treat like Joe said.
KW:	What about you Gwenan?
Gwenan:	It's the same as Edie.

It could be argued that Gwenan may have opened up more in an individual interview without the pressure of performing in front of the group. However, the one-to-one setting could have felt very pressurising for her without the presence of her friend.
As well as speaking on more occasions, children in the interview group also mentioned facilitators significantly more than children in the focus group and talked about features of the school outdoor environment which actually encouraged them personally to be active significantly more frequently. In addition, while a wide range of potential facilitators and barriers were put forward by children in each discussion setting, social factors and fixed equipment were topics of conversation which were spoken about more in interviews and these have been identified as important possible influences on children's PA at school (Escalante et al, 2014b; Hyndman et al, 2015).

As found previously (Heary and Hennessy, 2006), the focus group seemed to be a suitable forum for elaborating on ideas. Through the exploratory analysis, the theme '*Interference from others*' came across strongly as a barrier to being active whichever method was used. In the focus group, however, the main discussion about interference revolved around bullies. Once the idea of bullies was introduced, this concept was developed and maintained as illustrated by the following extracts which were in response to a question asking about what children might like to have/not have in their perfect play space.

Kieran: *'There would be no bullies.'*

Joe: *'I'd probably go with the same idea as Kieran and have no bullies. They do stop you and they like probably put you to the floor and stuff like that and fight...'*

Kieran: *....like punch you...*

Connor: *They tell you...like....you're not...you can't do that.*

Alice: *And like you're too weak.*

Connor: *And tell you...like....the opposite of encouraging you.*

Kieran: *Or they'll get in front of you...and also, they'll put their fists up or just block you.*

Children expanded on the nature and impact of bullying in the playground but there is the possibility that its importance as a barrier to PA has been inflated by the group process. However, the individual interviews also reflected the influence of other children using a range of descriptors to describe such interference including '*bully*' (Sian, Interview 4) '*naughty*' (Kate, Interview 2), *'people who boss you about*' (Thomas, Interview 3) and *'fighting and pushing'* (Sian, Interview 4).

It seems that focus groups, as on this occasion, may provide a setting where children can expand on a theme and provide more depth in their responses. However, the subject chosen for debate by the group might not always tie in with specific research objectives and children may well talk about concepts that energise them at the expense of topics that the researcher is interested in. In this instance, once the word 'bully' was with the group, children held onto it and used it to frame their responses so that elaboration perhaps took the place of diversity of ideas.

The focus group also failed to elicit measures that the school has put into place to address issues relating to anti-social behaviours and promoting inclusivity. It was only in the individual interviews that important peer support structures such as 'play leaders' and a 'friendship bench' were mentioned. These types of social and emotional support have been used with some success to tackle bullying and related behaviours in schools (Thompson and Smith, 2011) and may be important strategies for enabling children to be more active in the playground.

Qualitative interview techniques are conducted in a variety of settings which are likely to present specific challenges. Practical differences between methods may also need to be considered when deciding on the most appropriate interview strategy to use for exploring health behaviours. It is apparent, for example, that the focus group in the school setting was more time-friendly than the individual interviews. This is in contrast to Coenen et al (2012), who found that in adults, focus groups were the most time consuming when the whole research process was taken into consideration. Focus groups may not always be a quick option as considerable time may be needed for preparation, recruitment, transcription and analysis (Parsons and Greenwood, , 2000). Where children were recruited through GP practices for attendance at a community centre, for example, the research process was reported to be extremely time consuming (Morgan et al, 2002). For children in schools, however, many of the issues relating to recruitment and attendance are less of a problem than may be the case in community or medical settings. Focus groups with children in medical settings may require more commitment from parents, thus potentially biasing the sampling frame. Individual interviews can be carried out in the children's home, or for adolescents, by phone (Cuenca et al, 2015) thus widening access.

A 'neutral' yet 'familiar' setting is advised for children's focus groups as institutions such as schools and hospitals may carry negative associations (Topalidou et al, 2008). In the current study, children in the focus group behaved in a subdued manner which is in contrast to the natural exuberance and excitability that has been described by some as a feature when working with children's groups (Clark, 2011). This reticence to talk could, perhaps be attributed partly to being in a classroom which might have constrained the way in which some children responded (Gill et al, 2008a; Punch, 2002). However, finding space in a busy school can be difficult and a smaller, non-teaching room might not have been of an adequate size.

Without the influence and distraction of peers, the individual interview situation seemed to be one in which children could participate more fully and the interviewer could fine-tune the discussion more easily to the needs of the participant. Although some authors have noted that the power differential between adult and child in a one-to-one setting may be harder to equalise (Leonard, 2005), the interview setting in this study enabled the researcher to meet individual children as a novice researcher having a chat rather than as an adult working with a group, who, in a school setting may well be equated with an authoritative figure such as a teacher.

3.5.1 STRENGTHS AND LIMITATIONS

This study collected views from a focus group and six individual interviews from children at one school and selected participants randomly from a representative sample, from which only 2 out of 78 children were withdrawn (Non-response rate: 2.6%). Practical constraints due to school time availability precluded a larger sample size and it is acknowledged that the very small sample size may limit the extent to which the study can be generalised. However, this is a rigorous approach to exploring this issue which could now be replicated by other researchers.

In addition, the differences between focus group work and individual discussions may not be the same in different populations or conditions which again, might limit the study's generalisability. The topic of physical activity in schools, for example is a social topic which could lend itself well to group discussion. Follow-up studies could address how issues of a more sensitive nature, such as how bullying in the playground or parent influence affects children's PA, might be explored to most advantage. As well, researchers could compare focus groups and interviews conducted in more neutral settings than schools or clinics in order to understand how results translate into a wider range of circumstances.

That the researcher, KW, was an experienced teacher could be a particular strength of this work as she is familiar with ways of engaging children in a variety of situations, encouraging participation and focus and therefore able to question and encourage responses with some confidence in both interviews and the focus group. A moderator equipped with these kinds of skills is recommended for working with children in a focus group (Heary and Hennessy, 2002). Conversely, having worked in educational settings, which value group work, KW had some pre-conceptions that a focus group would yield richer data. These pre-conceptions could have unconsciously influenced data collection and analysis.

Boys and girls being mixed in the focus group could, potentially, have influenced the interaction between individuals. Mauthner (1997) suggested that single sex groups might be more successful than mixed groups which can be dominated by boys who tend to talk more and influence the direction of the discussion and in the current study, boys were considerably more talkative than girls in the focus group. Girls might have felt somewhat inhibited in this context and unable to voice some of their opinions. Mixed gender groups have been used successfully with children of this age (Davis and Jones, 1996; Hill, 1996; Tobin, 2000) although single-sex groups are often recommended (Clark, 2011; Heary and Hennessy, 2002). Gibson (2007) considered the issue of focus group composition with regard to gender and other group composition factors and concluded that the nature of the study as well as practicalities associated with individual studies are ultimately likely to guide focus group composition as was the case in the current study.

Due to constraints in the school timetable, there was little control over the time of day at which the interviews and focus group could be held so there is a possibility that children or the researcher might have felt more tired/hungry/replete depending on the time of day which may have changed the outcome of a discussion. The very small sample size meant that many differences between the data collection conditions failed to reach statistical significance and non-significant differences could not be taken to indicate equivalence.

3.6 CONCLUSIONS

Individual interviews with children are an effective and acceptable method for exploring children's perceptions of barriers and facilitators of PA. A well-matched focus group offered no advantages in terms of quality of data obtained. It is argued that for qualitative work in paediatric settings, one to one interviews should be the preferred option in order to ensure the widest possible participation and to increase the diversity of experience and view obtained. Further research is needed to replicate this finding in adolescent and younger samples.

CHAPTER 4

WHAT SCHOOL OUTDOOR ENVIRONMENT FACTORS ARE PERCEIVED BY PUPILS, PARENTS AND STAFF TO INFLUENCE LEVELS OF PHYSICAL ACTIVITY IN PRIMARY SCHOOL CHILDREN?

4.1 INTRODUCTION

In Chapter 3, a comparison between focus groups and individual interviews with children provided some evidence that individual interviews can be a suitable method for collecting rich information from children about how schools can facilitate their physical activity in the outdoor environment. Children who were interviewed spoke on more occasions, and provided more suggestions about what might facilitate children's PA than those in a focus group. Semi-structured interviews were therefore subsequently used in the qualitative study, described in this chapter which was undertaken to explore the views of children and adults about facilities and opportunities made available to children by schools for PA in the outdoor environment.

Physical activity is a complex behaviour, involving interactions between individuals and their social, physical, organisational and policy environments in an ecological system which operates at multiple levels (Sallis et al, 2015). Therefore, in order to understand how school interventions might influence children's PA, it is necessary to have knowledge of the network of factors which could have an impact. Through the literature review in this thesis (Chapter 2) social factors were highlighted as warranting further investigation and policy was also identified as an understudied area. Qualitative study was also identified in the literature review as being needed for better understanding of school related facilitators and barriers to children's PA.

In the current study, a socio-ecological framework, in which children's PA behaviours are viewed as being shaped by interactions between individuals and their environments, was used to explore adults' and children's perceptions of what aspects of school provision might influence children's PA in the outdoor environment. Semi-structured interview schedules were created for adults, based on the results of the literature review in Chapter 2 and, for children, based on a previously piloted schedule (Chapter 3), which were used to invite participants to talk about how schools might influence children's outdoor activity through physical, social and policy aspects of their environments. These frameworks allowed for a thorough exploration of participants' perceptions of how school could be involved in facilitating children's active behaviour.

Through the lens of critical realism, it is acknowledged that '*all knowledge is partial, incomplete, and fallible'* (Maxwell, 2012), being represented and constructed through particular worldviews. Interviews, in this context, offer a way to gain access to individuals' accounts of their actual experience and events, from which insights might be gleaned as to the underlying structures (Smith and Elger, 2012). In a school setting, there will be a unique mix of social and power relationships, educative strategies, resources and regulations and this web of factors might come to be more clearly known through qualitative exploration. In-depth answers to semi-structured questions could potentially elicit new views and angles about school-based factors thought to be important for encouraging young people to be active in an outdoor environment. The interview data in this study represent the perspectives of the participants, in relationship with the researcher and the analysis is an interpretation of those data made by the researcher, reflecting her own knowledge, attitudes and experience, which are acknowledged in a reflexive statement.

4.2 BACKGROUND

As detailed in Chapters 1 and 2 (Sections 1.5 and 2.2), schools are well positioned to encourage children to be active in the outdoor environment (Public Health England, 2020a) through taking an integrated, whole school approach, involving curricular learning, creating supportive cultures and environments, promoting active travel and family involvement as guiding principles (Public Health England, 2020a).

A considerable number of qualitative, correlational and experimental studies have previously investigated school factors which might be related to children’s activity in the outdoor environment and are summarised in a number of reviews (Broekhuizen et al, 2014; Escalante et al, 2014a; Messing et al, 2019; Ridgers et al, 2012b; Stewart et al, 2012). In their systematic review of studies investigating PA at recess, however, Ridgers et al (2012b) found few studies which focused on social influences and an even smaller number which explored policy variables which might have an impact on children being active when they are outside. Studies of how school policies might impact on children's PA have been described as being *'in their infancy'* (Lounsbery et al, 2013) so the type of and level of adherence to policy could turn out to be an important direction to follow when exploring how schools might have an impact on children's PA. In order to understand how schools might influence children's PA behaviour in the outdoor environment, a more comprehensive picture is needed of the full range of factors which could be involved.

School sites are historically and typically institutional spaces designed by adults and managed in ways that are thought by adults to be in children's best interests (Thomson, 2007). Adult perspectives about what factors might encourage children to be active clearly need to be considered as adults form an integral part of a school community and are in a position to observe and interact with the children in their care as well as being in control of budget decisions. The ways in which adults construe the world of play, (Lester and Russell, 2008) and respond to fears and responsibilities such as those associated with playground safety (Hyndman and Telford, 2015) or active transport (Stewart et al, 2012) are likely to be closely linked to the ways in which schools design, resource and manage their school grounds, curriculum and policies.

However, it is children who work and learn within this framework and the importance of seeking their views in order to understand their world of childhood has been highlighted (Harcourt and Einarsdottir, 2011; Jansson et al, 2014). Children are increasingly being recognised as experts in their own lives (Tisdall, 2018) and their voices thought to be '*integral to research and interpretations about children*' (Clark, 2011 P.11) and '*critical.....when making recommendations that might affect their opportunities for play'* (NICE, 2008 P. 39).

Previous studies setting out to gain insight into how the school environment might influence children's PA have sometimes focused on the views of either adults (Christian et al, 2015; Huberty et al, 2012) or children (Hyndman and Telford, 2015; Parrish et al, 2012; Pawlowski et al, 2014; Willenberg et al, 2010). To acknowledge the wide ranging perspectives of adults and children regarding children's PA in the outdoor environment, pupils' ideas need to be explored as well as those of school staff and the wider community who are invested in the school. This kind of knowledge from stakeholders across the board is thought to be important for understanding how the design of school grounds might influence aspects of behaviour (Foster et al, 2006) and how fears of injury and litigation alongside attitudes regarding outside learning experiences can be influential in determining policies relating to outdoor activities (NICE, 2008).

4.2.1 THE CURRENT STUDY

The main objective of this study was to investigate adult and child perspectives about what aspects of the school environment might encourage children to be active or discourage them from being active in outdoor spaces with a view to understanding better the barriers and facilitators of children's PA in the primary school setting.

4.3 METHODS

4.3.1 PARTICIPANTS

Participants were staff, parents and pupils from 4 Nottinghamshire primary schools, who were selected to reflect social and structural diversity. The target sample size for pupils was 24 (6 children per school), which was expected to achieve data saturation. Children were eligible for inclusion in the study if they were in year 6 and present in school on the day of interviews. For adults (school staff and parents), the aim was to recruit 5 adult participants from each school; a class teacher, a teaching assistant, a midday supervisor, a parent and a member of the senior management team, making a target sample size of 20, again based around expected data saturation.

Estimates of the sample size needed in qualitative studies vary considerably. Ideally, a sample size should be large enough so that saturation of themes can occur, although this needs to be balanced against time and financial costs of completing more interviews and transcriptions as well as the challenges associated with accessing research participants (Adler and Adler, 2012). Charmaz (2006, p. 114), for example suggested that a sample size of 25 would be adequate for a small study whereas Guest et al (2006) concluded that a sample of 6 interviews might be enough to allow main themes to be developed in a homogenous sample. A range of '*between 12 and 60, with 30 being the mean'* was advised by Adler and Adler (in Baker and Edwards, 2012). Guest et al (2006) found that new themes were coded very infrequently after the 12th interview (of 60) although they advised that if the domain of enquiry was 'diffuse' and the participants heterogeneous, then more participants might be needed. In the opinion of Green and Thorogood (2004), new information is not usually found after the 20th interview of people in one specific group. Crouch and McKenzie (2006) have argued that small sample sizes of around 20 participants enable the researcher to retain detailed knowledge of the entire dataset in their mind which is more difficult with a larger dataset. A smaller sample size is thought, therefore, to be best for exploratory studies. These guidelines informed the sample size estimations for the current study which were made to be large enough so as to allow a broad research field to be examined thoroughly whilst remaining manageable in terms of data transcription and collation.

All Primary and Junior state schools (n=318) within Nottingham (37 schools) and Nottinghamshire (n=281 schools), were invited to participate in the study by email to head teachers with the aim of recruiting four schools through a process of maximum variation sampling (Patton, 1990). For this stratification, all 318 schools were catagorised by size, location, and disadvantage (through pupil premium status). This used information about the number on roll at a school ('larger than average', 'average', 'smaller than average') as classified by the most recent Ofsted report for the school, location (urban/rural) determined by rating a place as 'town/city' or 'rural' on the basis of a 'Google' search and Pupil Premium status ('above average', 'average' or 'lower than average') as classified by the most recent Ofsted report for the school. Pupil Premium is extra funding allocated to publicly funded schools in England to help to raise the attainment of disadvantaged children (Foster and Long, 2020). Disadvantaged children are eligible for Pupil Premium if their parents/carers receive benefits and have applied for their children to have free school meals. Pupil Premium status is categorised by the % of children attending that school who are eligible, with a higher percentage indicating more children from disadvantaged backgrounds at that school.

Schools in each category were selected on the basis of random number generation (See Table 4.1). Schools were randomly selected (using a random number generator) from each of the possible 18 categories and invited a few (per category) at a time. If schools declined to participate, or did not respond within a few days of a reminder email, a new random number informed selection of the next school from that category. When a school from one category agreed to participate, no further schools were invited from that category. In total, 194 schools were invited from a list of 318 schools from which 4 agreed to participate within the time frame. The numbers of schools in each category and the numbers of schools invited are shown in Table 4.1, with the four recruited schools marked into the categories to which they belonged.

	RURAL			**URBAN**		
	Number on Roll High	**Number on Roll Average**	**Number on Roll Low**	**Number on Roll High**	**Number on Roll Average**	**Number on Roll Low**
Pupil Premium High	**1** *1*	**9** *9*	**5** *5*	**57** *17*	**53** *26* School 4	**7** *7*
Pupil Premium Average	**1** *1*	**5** *5*	**2** *2*	**8** *4* School 1	**13** *9* School 2	**0** *0*
Pupil Premium Low	**9** *9*	**32** *31*	**43** *26* School 3	**34** *17*	**39** *25*	**0** 0

Table 4.1: Schools available for recruitment (**Bold**) and schools invited (*italics*)

At each of the four schools that agreed to participate, adults were recruited to the study by means of a poster in the staff-room. Study information, including a leaflet for children was sent home to the parents of Year 6 children at the 4 schools (n=92) together with opt-out consent forms. At School 1, this was to only one of two Year 6 classes due to staffing arrangements at the time. On the day of the interviews, prior to starting, 6 children from each school (3 boys and 3 girls) who were present and who were not opted out of the study, were randomly selected to be interviewed by matching random numbers against lists of the eligible boys and girls, so that 3 boys and 3 girls from each class were selected. The researcher, KW, in visiting the schools confirmed or refined location descriptors so that the four schools could be described as ‘rural’, ‘urban’ or ‘suburban’.

4.3.2 ETHICS

All adult participants gave verbal and written informed consent. All participating children had opt-out consent from parents, gave verbal assent and signed a child-centred agreement form before taking part in the study. The study was given ethical approval by the Faculty of Medicine and Health Sciences Research Ethics Committee at the University of Nottingham (Ref: B14052015 SoM ROD; Appendix 1).

4.3.3 MATERIALS

Interview schedules were developed for child participants and staff respectively. The child interview (Table 4.2) consisted of 5 main items plus probing questions and was piloted with 6 children prior to undertaking this study (See Chapter 3). It was found to be a useful structure for eliciting wide ranging and detailed responses, and was considered to be appropriate for use in the present study. An adult interview schedule (Table 4.3) was developed by the researcher based on literature in the field. Adults were asked to provide their date of birth, length of time they had worked at the school and their roles.

Interview Structure for Children

Introductions/confidentiality/consent

'I am interested in finding out about how schools including your school can help you to be active in outside spaces and what might stop you from being active. I really want to hear all of your views. There aren't any 'right' or 'wrong' answers. I might ask you some more about a point that you make as it could be particularly useful.'

1. To begin with, please could you tell me what and who would be in your perfect play space at school if you could have any design and any people that you wanted. Who would the people be? Would there be any adults? How many people?
2. Who wouldn't you have?
3. Thinking about your own playground now, what kinds of things help you to be active?
4. Is there anything that stops you from being active?

Prompts

Physical Environment

- Are there any particular pieces of equipment which encourage you to move around more?

If yes: What is it about that which encourages you to move around more?
If no: What would you like which might encourage you to move around more?

- Are there any particular parts of the playground/school grounds where you move around more?

What is it there that encourages you to move around more?
Is there anything in the playground/school grounds which puts you off moving around more?

- How do you travel to and from school?

If active: Are there any ways that the school makes that easier/harder for you?
If passive: Is there anything the school could do/does/could stop doing to encourage you to walk/cycle/scooter to school?

Policy Environment

- Are there any rules that you have here in your school which encourage you to move around more?
- Are there any rules that you have here in your school which might put people off or stop people moving around more?
- Do all children play out at the same time at playtimes?

Does that work well to help children to get moving around?

- Is there anything which stops children from going out to play?
- How many adults are usually out with you at playtimes/lunchtimes?
- Are you allowed to play on the playground before/after school?

What kind of rules are there about that?

- Do you have any lessons outside?

5. If you look at these pictures now, which things do you think would help you to be most active? Which might be least helpful? What makes you think that?

Table 4.2: Interview schedule for children

Interview Structure for Adults (*Addditional prompts in italics*)
Introductions/Confidentiality/Consent
'I am interested in finding out what you think about how this school influences the way that children are active outside.'

Physical Environment
What do you think there is in this school's outdoor environment which encourages children to be active?
Particular equipment?
Particular areas of the school grounds?
Are there particular spaces or particular times allocated to groups of children?

Where do you notice children being less active?
Has the school invested in its outdoor spaces recently?
If so, what has it changed?
How has this affected children's physical activity?

Social Environment
How are adults involved outside during break times?
Do teachers/midday supervisors/teaching assistants lead any games activities?
What do you notice about girls' and boys' activity at playtimes?
Do girls and boys play together?
What kinds of activities do boys and girls take part in?
Are there any policies for adults regarding physical activity in the school?
For example, are teachers required to change for outdoor PE?

Policy Environment
What happens to outdoor play or outdoor PE when the weather isn't so good?
What rules/policies do you know of that affect outdoor PE?
What rules/policies do you know of that affect playtimes?
What rules/policies do you know of that affect before/after school in the playground?

General
How do you think the school supports children to travel to school in an active way?
Cycling Proficiency? Incentives? Cycle racks? Helmet storage?
Does the school run lessons outside?

Do you think there is anything that the school does which stops children being as active as they could be at break times or before or after school?
What more do you think this school could do to encourage children to be more active?

Table 4.3: Adult interview structure

4.3.4 PROCEDURE

4.3.4.1 ADULT INTERVIEWS

Staff and parents responded to a poster inviting adult members of the school community to participate in the study by either expressing their interest to a designated school co-ordinator or contacting KW by email and were provided with participant information. Semi-Structured Interviews with adults who had agreed to take part took place during the school day and after school in a space convenient to the school. At the start of each interview, participants were given time to ask questions about the study, after which they signed and dated a consent form. Adults were asked initial questions according to the prepared schedule (Table 4.3) and prompted to expand further as necessary. Interviews were audio recorded, with consent, and subsequently transcribed verbatim. Original recordings were transferred to CD and stored securely according to the agreed protocol. Adults were assigned a numerical identifier.

4.3.4.2 CHILD INTERVIEWS

The project co-ordinator at each school prepared an interview timetable so that children and KW were aware of the allocated time slots. Interviews with children took place during the school day in the same space used for interviewing the adult participants. Before starting each interview, children were taken through the child-centred information leaflet carefully, ensuring that there was plenty of time for discussion and questions and then children were asked if they would like to take part. To note their agreement, children signed a child-centred assent form and were given a copy to keep for themselves.

Each child, during their interview slot sat at a table with KW and was asked questions according to the prepared schedule (Table 4.2). Prompts were given to help children to respond more fully and a picture-based task was also introduced later in the interview slot to stimulate further discussion. Twenty A5 sized photographs, depicting a variety of equipment, spaces, people and signs which might be found in a school's outdoor environment were placed in front of the participants and children were asked to select pictures which stood out to them in any particular way and to comment on how items seen in the images might encourage young people to be active or discourage them from being active (See Figure 3.1). Children were able to handle and group the photographs and to place them to one side if they wanted to be reminded of a particular thought. In choosing which photographs to talk about, children could direct interviews in a way that interested them, and to talk about factors which might not have naturally emerged from the interview questions. Task-based strategies such as this have previously been used alongside focus groups or individual interviews in research with children about physical activity with a view to enabling children to express their ideas more freely (eg. Darbyshire et al, 2005). Particularly in a one-to-one situation, combining a traditional research technique such as interviewing with a practical task could help a child to open up to an unfamiliar adult who may potentially be viewed as an authority figure (Punch, 2002). Interviews were audio recorded, with consent, and subsequently transcribed verbatim with any personal identifiers removed. Pseudonyms were used to protect the identity of all participants.

4.3.5 DATA ANALYSIS

Data analysis was conducted through inter-related and iterative processes of firstly, a deductive qualitative content analysis to code and group descriptive, manifest interview content (Elo and Kyngas, 2008) and, secondly, an inductive thematic analysis (Braun and Clarke, 2006) in order to produce a description of and draw meanings from the underlying patterns in the data. The author recognised that her prior knowledge of the literature and previous interviews with children about the topic was likely to have some influence on identifying codes and organising the data during the inductive process.

4.3.5.1 CONTENT ANALYSIS

Content analysis is a technique used to organise text systematically and objectively into a summary form (Elo and Kyngas, 2008). Deductive qualitative content analysis may be used in situations where the researcher wishes to examine pre-defined categories as was the case in this study with the purpose of describing those categories fully and to generate items for a survey (Forman and Damschroder, , 2008). Categories about equipment, activities and games were created as these were topics that were frequently mentioned by children in previous interviews (Chapter 3) and a fourth category was formed for school policies which support ATS as there is some evidence that PA can be increased successfully by ATS interventions (Chapter 2, Section 2.2). Data in the current chapter were compared against these categories with a view to finding further evidence that these patterns/categories exist at an empirical level as viewed in the layered ontology of critical realism.

Three main stages of content analysis have been described; preparation, organising and reporting (Elo and Kyngas, 2008). In the preparation phase, data are collected, collated and broken up into smaller units of meaning. KW familiarised herself with the data through the interview process itself, transcribing the data herself and then reading and re-reading the interview scripts. Units of meaning were determined to be simple descriptors of equipment such as 'climbing frame', activities such as 'running around' or games such as 'basketball'. In the organising phase, units of analysis were identified and highlighted in the written transcripts and later allocated to the pre-defined categories. The results were then reported using tables indicating who (adult or child) made the statement, which aspects of the outdoor environment were considered to be important and the frequency of mentions of that aspect.

4.3.5.2 THEMATIC ANALYSIS

After the initial content analysis, further patterns/themes were developed through a process of inductive, thematic analysis of the raw data to allow for a more complete exploration of the data. Braun and Clarke (2022) describe thematic analysis (TA) as being a '*family of methods'* on a '*TA spectrum'*, and in the current study, a 'codebook approach' was taken (Braun and Clarke, 2021; Braun and Clarke, 2022). This lies on the TA spectrum between 'coding reliability TA', often characterised by a focus on objectivity, reliability and deductive coding and 'reflexive TA', founded on qualitative research values and the researcher's own unique contribution to data analysis with theme development being open and iterative. Thus, in this study, a codebook was developed, not early in the process, as would be the case in 'coding reliability TA', but after a lengthy period of data immersion, reflecting themes generated by a reflexive researcher, more typically representative of 'reflexive TA.' The codebook was used as a working document, mainly as a record of the developing code and as a means for exploring ideas.

Within this framework of thematic analysis, the researcher aimed to make an interpretation of individuals' perceptions about school outdoor environmental attributes, paying close attention to the details of school life, relationships, equipment and systems in order to gain in-depth information about how schools can influence children's PA choices. With no pre-determined scaffold, there was a possibility that new insights could be made (Braun and Clarke, 2006) which could be indicative of underlying causal mechanisms and form the basis of theory and hypotheses for future investigations (Westhorp et al, 2011).

A process of familiarisation, organisation and refinement (Boyatzis, 1998; Braun and Clarke, 2006; Braun and Clarke, 2021; Vaismoradi et al, 2016) was used to construct themes. Familiarisation, as in the content analysis, came about through the interview and transcription processes along with repeated reading of the data in order to draw out meaning. During the interview process, KW began to note issues that could be of interest and through transcribing the data herself and reading and re-reading the transcripts, began to notice patterns which formed initial impressions of how the data might be organised. A more detailed phase of organisation followed during which initial codes were created which reflected chunks of meaning in the data thought to be important by the researcher. These were, for example, based on mentions of particular features of the school outdoor environment and how these were perceived by the participants. Participants' ideas about relationships and school procedures formed the content of other codes. Codes were marked on the text in a 'Word' document using highlighter colours to represent provisional themes. These provisional theme titles were later written onto large pieces of paper under which codes with similar underlying ideas were organised. The positioning of codes was repeatedly reviewed, themes adjusted and re-worked to accommodate new information and sub-themes created to form the most coherent organisation of the data. The themes were then named and described with reference to extracts from the verbatim interviews which were labelled using pseudonyms and numerical identifiers.

4.3.5.3 TRUSTWORTHINESS

Several skills and strategies were used during the process of analysis to establish trustworthiness. According to Lincoln and Guba (1985), the key ideas involved with establishing trustworthiness in qualitative research include the concepts of credibility, transferability, dependability and confirmability. Various authors have described these criteria and some have compiled guidelines for how they might be demonstrated in qualitative work (Elo et al, 2014; Guest et al, 2014; Lincoln and Guba, 1985; Nowell et al, 2017; Ulin et al, 2005). This information and guidance is summarized in the following paragraphs and Table 4.4 with examples of how the key concepts were addressed in practice.

Credibility is used as a term in qualitative work to represent the concept of validity (Guest et al, 2014). In this study, credibility was enhanced by the investigator's experience of working in schools, interviews in which participants were given plenty of time to speak about the research topic and challenges put to the researcher regarding methods and analysis. Transferability is a concept representing the idea of generalizability and may be strengthened by the researcher presenting readers with sufficiently rich information or 'thick description' (Lincoln and Guba, 1985) so as to allow them to judge for themselves whether the findings might transfer to a new context. Purposive sampling helped to ensure that multiple perspectives were sought in this study and numerous examples from the raw data were presented to exemplify the author's analysis.

The idea of dependability is analogous to reliability and in qualitative work means checking that the research process is consistent and the results dependable (Guest et al, 2014). One way of checking that the results of the analysis are a fair representation of the underlying data and replicable is to explore consistency of themes. This was achieved by means of inter-coder assessment. A code-book was created which provided a list of themes, sub-themes, descriptions of the themes and example quotes of what did and did not represent each theme (Boyazis, 1998). A second coder was presented with random quotes belonging to different themes and asked to code them according to the code-book. Subsequently, a percentage agreement of 72% was determined between the two coders. A value of 70% agreement is considered necessary for there to be some confidence in the consistency of the code (Boyazis, 1998). Inter-coder reliability has been viewed by some as being incompatible with a qualitative tradition in which data coding and analysis is inevitably subjective (Braun and Clarke, 2022). It has also been argued that, whilst interpretation of qualitative data involves the researcher's own perspective, this does not negate the value of demonstrating that the '*basic analytic structure has meaning that extends beyond an individual researcher*,' and the transparency and rigour of the research process (O'Connor and Joffe, 2020). Value may also be found when a reliability measure is used for self-monitoring and refinement processes (O'Connor and Joffe, 2020).

The fourth element of trustworthiness is confirmability which involves some kind of confirmation that the participant's own experiences and perceptions are reflected in the findings. This can be achieved to some extent by researchers being aware of how they are engaged in the process and striving to minimize the influence of their own values and beliefs on the investigative process and the product of enquiry. A reflexive approach, acknowledging how personal history, assumptions and biases might be reflected in the creation of results can contribute to the confirmability of a study (Ulin et al, 2005) and, ideally, participants might consider how accurately the findings represented their views.

4.3.5.4 POSITIONALITY

In any research encounter, the research process is moulded by the researchers and those being researched, and can be influenced and changed by both parties (England, 1994; Bourke, 2014; McGarry, 2015). A researcher is not simply a neutral observer (Barker and Smith, 2001; England, 1994) but plays an active role in the research encounter which needs to be viewed through a reflexive examination of self in relation to another in order to acknowledge how personal attitudes, biases and history might influence understanding and interpretation of findings (Cope, 2009). Through acknowledging unique personal traits, the researcher becomes more transparent and allows others to see the process of knowledge generation. Personal factors which could influence decisions and interpretations are out in the open and can help others to make sense of research outputs and consider challenges to the work. In addition, research can be seen as being '*characterised by complex and nuanced power dynamics*' (McGarry, 2016, p.1-2) and a failure to understand these relationships is also likely to lead to a misconception of knowledge generated through the research process.

These power relationships exist, whether acknowledged or not and are still there even when all efforts are made to minimise them. Being open and explicit about unequal power relations is essential so that the partial and incomplete nature of the research is recognised (England, 1994).

Criterion for trustworthiness (Lincoln and Guba, 1985)	How criterion was addressed
Credibility **Are the participants' views adequately represented by the researcher?** • Confidence in the 'truth' of the findings • Ensure that context is understood • Spend time with participants to allow for depth of enquiry • Build trust with participants • Use multiple sources • Transparency of process • Biases challenged by others	• Awareness of school culture • 24 child Interviews and 17 interviews with adults in different roles carried out at 4 schools with different characteristics. Interview schedules meant that participants gave views on the same topics. Adult interviews were un-hurried and naturally ended when participants had no more to add. Interviews with children were sometimes rushed due to timetabling issues. • Discussion of data, categories, themes and processes with academic mentors. However, as mentors are PhD supervisors, this could, in itself influence thinking. • KW examined own thought processes reflexively • Interview schedules created with input of team. Probing questions allowed for deeper exploration to occur. Open-ended questions reduced constraint on responses. • Verbatim transcription by one transcriber • Negative cases consciously sought and included
Transferability **How likely is it that the findings will apply in new contexts?** • Samples selected to represent different viewpoints • Contextual factors described	• Purposive sampling to seek variation in perspectives • Adults with different roles and children, both boys and girls were interviewed • Details provided about participants, methods, context, researcher
Dependability **Is the process of research logical and clearly represented?** • Can the process of obtaining the results be replicated?	• Creation of code-book • Code-book challenged and changes made • Inter-coder agreement of codes established • As only one interviewer, schedules could be used with some consistency across all interviews.
Confirmability **Are the findings clearly derived from the data?** • Reflexivity used to acknowledge potential biases	• Reflexive statement used to report potential biases, experience and motivations • General consideration of trustworthiness • Verbatim quotes used to exemplify themes

Table 4.4: Strategies and skills used to enhance trustworthiness

4.3.5.5 REFLEXIVE STATEMENT

The interviewer (KW) was female and a teacher with over 30 years of experience of working with children and used to working within the routines and constraints of a school setting. Having observed children working and playing outside in numerous settings, KW was positive about the importance of outdoor spaces for encouraging young people to be active and also aware of the challenges regarding these spaces. KW was sensitive to gender differences in the playground and issues regarding behavior.

KW understood school culture and was very aware of how children might respond to a visitor. She was used to building rapport quickly with children and familiar with interacting with a wide range of school staff. It is possible that adults, knowing KW to be a teacher, would be unlikely to exaggerate or embellish their school's provision as it would be clear that KW was used to a school setting. They might have been able to share experiences more easily knowing that KW understood the school system. Conversely, some adults might have portrayed their school in a favourable light for reasons of social desirability.

KW had not previously worked at any of the 4 schools in this study. Child participants were aware that she was a teacher through the information leaflet and also knew that she was not there in that role on the day of interviews. KW was comfortable with talking one to one with a child and able to adapt easily to the language needs of each individual. As a novice researcher, KW was also aware of the need to avoid coming across too strongly as a teacher or any authority figure so as to encourage a forum for discussion where a child would feel able to speak freely. Particularly within the school building, where there are rigid codes of behaviour and where adults do represent authority, it was especially important to aim for a relationship of equality, albeit that it is difficult to attain. To this end, KW introduced herself by her first name, invited children to choose their own seat and fostered a light, informal atmosphere, thanking children for their contributions and reassuring them if they were worried that their responses were wrong.

KW had had some experience of interviewing children previously, both in an earlier phase of the current study (Chapter 3) and for a small health research project outside schools and therefore had some understanding of the interview process and an awareness of the need to engage as a researcher rather than as an educator. It is possible that personal observations made within school settings over many years may have influenced the way in which KW phrased some of the questions or prompted further responses.

4.4 RESULTS

Across the 4 participating schools, 17 adults responded to a poster inviting them to be interviewed within the study time-frame (September-December, 2015). The number of adults participating at each school and their roles can be seen in Table 4.5. Adult participants ranged in age from 23-57 years old and the 15 school employees had worked at the schools from between 1 and 23 years. Interviews with adults lasted from between 7m 29s and 43m 32s. The adult participating in the shortest interview had other commitments and later provided more details by means of email. The timings for all other participants were relaxed and unhurried, giving chance for each adult to respond fully, with as much detail as they wanted to give.

Role in School	**School 1**	**School 2**	**School 3**	**School 4**
Teaching Assistant	1 Female	2 Female	1 Female	1 Female
Mid-day Supervisor	1 Female	1 Female		1 Female
Head Teacher	1 Male			
Teacher	1 Male			2 Male
Parent	1 Female	1 Female		
Administrator			1 Female	
Learning Mentor		1 Female		
Sport's Apprentice				1 Male
Total Number of Adults	5	5	2	5

Table 4.5: Number and roles of adult participants per school

A total of 92 children across the 4 schools were invited to take part in the interviews. Three children (3%) from 2 schools returned opt-out forms. Specifically, the numbers of children eligible to be chosen at each school are shown in table 4.6 alongside the characteristics of the schools. It can be seen that the four schools were a diverse sample with varied attributes regarding their location, size and pupil premium percentage. Interviews with children lasted from between 13 and 22mins. Most interviews with children took a natural course and ended when a child had nothing more to add. However, a small number of interviews were rushed (n=2) and in these cases, the children did not have time to finish responding to all interview questions.

School	Location	Number on Roll	Pupil Premium	Number of invited children in Year 6	Number opted out
1	Suburban	Larger than average	Average	16	1
2	Urban	Average	Above Average	30	0
3	Rural	Smaller than average	Below Average	16	0
4	Suburban	Average	Above Average	30	2

Table 4.6: Characteristics of schools

4.4.1 CONTENT ANALYSIS TO EXAMINE FACTORS THOUGHT BY ADULTS AND CHILDREN TO BE IMPORTANT FOR PROMOTING CHILDREN'S OUTDOOR PHYSICAL ACTIVITIY

Interview transcripts were studied with the aim of identifying instances where participants had named specific types of equipment, activities, policies relating to active transport and games they thought to be important for encouraging children to be active outside.

Firstly, the fixed and loose equipment types that adults and children mentioned as being potentially or actually facilitative were collated and are shown in Table 4.7. Items of loose equipment mentioned most frequently by adults and children were skipping ropes, hula hoops and balls, including footballs. Children from all four schools also commented on painted targets that they saw in the picture activity. Trim trails, climbing frames and climbing walls were pieces of equipment talked about on many occasions by adults and children. Slides were also considered to be attractive by several children and hopscotch was mentioned by several children and adults. When thinking about their ideal play spaces, children also included equipment items and ideas for activities of a more sedentary nature such as a 'chill-out' room, board games and a library.

Loose Equipment	Mentioned by Adults (n)	Mentioned by Children (n)	Fixed Equipment /facilities	Mentioned by Adults (n)	Mentioned by Children (n)
Basketball equipment	1	1	Basketball nets	4	1
Skipping/Ropes	11	9	Basketball hoops	1	6
Hula Hoops	11	4	Trim Trail	9	12
Bean Bags	3	1	Football Goals	3	4
Footballs	2	4	Hopscotch	3	5
Ribbons	0	1	Chill out room	0	1
Balls	5	3	Climbing Frame	6	12
Bats	2	0	Basketball court	1	2
Tennis racquets	0	1	Football pitch	1	6
Fitness equipment		1	Tunnel	0	2
Trolley/box of Equipment	3	1	Playground markings	4	3
Outdoor Javelin	1	0	Climbing wall	3	10
Parachute	2	1	Slide	1	6
Litter Pickers	0	1	Swings	1	3
Stilts	2	1	Tyres	1	2
Hockey Sticks	0	1	Running track	0	3
Large dice	1	0	Seat	0	1
Chalk	0	2	See-Saw	0	1
Imaginary items	0	1	Football nets	0	2
Computers	0	1	Monkey bars	0	4
Ball Scoops	2	5	Assault/Obstacle course	0	3
Clipboards	0	1	Shelter	0	4
Music equipment	1	1	Netball court	0	1
Cones	0	1	Park equipment	0	1
French skipping	3	1	Benches	0	1
Trampoline	1	1	Willow tunnel	0	1
Animals	0	1	Swimming pool	0	1
Lap-tops	0	1	Bike racks	0	2
Archery/Targets	0	5	Flower planters	0	2
Frisbees	0	3	Gymnastics area	0	1
Digging equipment	1	0	Library	0	2
Tag for tag rugby	1	0	Zip wire	0	1
Own equipment	1	0	Go Ape	0	1
Sand-pit	2	0	Mud kitchen	1	0
Bikes	1	0	Snakes and ladders	1	0
Balancing rail	1	0	Arches	1	0
Bricks	1	0			
Water buckets	1	0			
Bricks	1	0			

Table 4.7: Equipment mentioned by adults and children

Secondly, games and activities mentioned by children and staff were explored. Most of the adults named specific games and activities which they thought children enjoyed and all children talked about the kinds of activities they liked or that they thought would encourage them or others to be active. Games and activities thought to encourage physical activity are shown in Table 4.8. Nearly two thirds of adult and child participants spoke about football as being a game that kept children active. Some adults also thought that children enjoyed tag rugby although only one child spoke about this game. Basketball and tennis as well as running and chasing games were considered to be fun physical activities by many children. Traditional chasing games of the 'tag/tig/dob' variety were mentioned by four adults, and many of the children spoke about them as being ones they played.

Games/Activities	**Mentioned by Adults (n)**	**Mentioned by Children (n)**	**Games/Activities**	**Mentioned by Adults (n)**	**Mentioned by Children (n)**
Football	10	15	Walking	1	2
Tag rugby	4	1	Rounders	2	0
Basketball	3	8	Tennis	2	7
Cat and mouse	1	1	Multiskills	1	0
Netball	0	1	Balancing	1	1
Rugby	1	1	Bat games	0	1
Dodge ball	2	1	Bulldog	2	0
Athletics	1	0	Cheerleading	1	0
Baton relay	0	1	Catching/throwing	2	1
Racing	1	1	Wake and Shake	1	0
Running	3	7	Acrobatics	0	2
Hockey	0	4	Sit down and talk	0	1
Cross country running	0	2	Board games	0	1
Sitting and chatting	2	1	Swimming	0	1
Wandering round chatting	1	2	Badminton	0	1
Riding bikes	1	0	Boxing	0	1
Roller skating	1	0	Climbing trees	0	2
Scooters	1	0	PE	0	3
Make games up	1	3	Sack races	1	0
Cricket	2	5	Gymnastics	0	2
Team games (General)	1	0	Triathlon	0	1
Ball games	2	2	Dancing	0	2
Jumping off equipment	0	1	Hide and Seek	0	1
Jumping	1	0	Pool/Snooker	0	1
Child directed eg Superheroes,Army	1	0	'Positive play' games	1	0
Tag/Chase/Dob/ Tig/chasing games	4	10	Forest Skills/ make dens	0	2
Table tennis	0	2			

Table 4.8 : Games and activities mentioned by adults and children

Thirdly, active transport was examined. Adults and children mentioned a number of strategies that they considered would encourage children to travel actively to school. Responses are shown in Table 4.9. 'Walk to school' week was a common strategy as well as cycle training for the older children in the form of ‘bikeability’. Provision of cycle storage was seen as important for facilitating children's activity before and after school. Several adults talked about rewards in the form of charts, stickers and badges that might encourage children to walk or cycle to school.

School factors which facilitate active transport	**Number of children mentioning strategy as being facilitative**	**Number of adults mentioning strategy as being facilitative**
Walk to school days/week	0	9
Cycle storage	12	9
Storage for bike helmets	3	1
Health messages in curriculum	1	0
Environmental messages in curriculum	1	0
Mapping	0	1
Surveys	0	2
Travel plan	0	2
Junior Road Safety Officers	0	1
Car-park removed	0	2
No major roads to cross	0	1
Bikeability	3	10
Road safety training	0	1
School allows heelies	1	3
Walking school bus	0	3
Day for bringing bikes and scooters to school	1	1
Cards/stickers/badges/ footprints challenge/raffle tickets/prize	1	5
School factors which are barriers to active transport		
No cycle storage	5	4
Rule banning bikes and scooters	1	0
Parent needs to take bike home	1	0
No crossing patrol	0	2

Table 4.9: Active transport facilitators mentioned by adults and children

4.4.2 THEMATIC ANALYSIS TO EXPLORE PERCEPTIONS OF THE RELATIONSHIP BETWEEN THE SCHOOL OUTDOR ENVIRONMENT AND CHILDREN'S PHYSICAL ACTIVITY

Nine main themes with regard to factors which might influence physical activity in the outdoor environment were identified across the interviews with adults (identified by number) and children (identified by pseudonym) which are summarised in Table 4.10. Each of these is now explored in turn.

THEME 1: **SPACE ENCOURAGES PLAY**			
THEME 2: **SAFETY CONCERNS ARE A BARRIER TO CHILDREN BEING ACTIVE OUTSIDE**			
THEME 3: **CHILDREN'S PA IN THE OUTDOOR ENVIRONMENT IS INFLUENCED BY PEERS**	*Sub-theme 3.1:* *Anti-social behaviour in the playground deters children from being active*	*Sub-theme 3.2:* *Children help other children to be active through defined roles*	
THEME 4: **ADULT PRESENCE AND INTERVENTION SUPPORTS PHYSICAL ACTIVITY IN THE OUTDOOR ENVIRONMENT**	*Sub-theme 4.1* *The outdoor environment is a space to develop independence*		
THEME 5: **EQUIPMENT PROVISION FACILITATES CHILDREN'S OUTDOOR PA**	*Sub-theme 5.1* *Design of equipment is important to children*	*Sub-theme 5.2* *Availability of equipment affects mood and behaviour*	
THEME 6: **VARIETY OF PROVISION FACILITATES PHYSICAL ACTIVITY**	*Sub-theme 6.1* *Variety of spaces to suit individual preferences facilitates PA*	*Sub-theme 6.2* *Grassy and natural areas are popular spaces for PA*	*Sub-theme 6.3* *Outdoor space needs to be tailored to suit children of different ages*
THEME 7: **PHYSICAL ACTIVITY IS ENCOURAGED THROUGH OPPORTUNITIES FOR OUTDOOR LEARNING**	*Sub-theme 7.1* *Outdoor PE enhances children's PA*		
THEME 8: **FOOTBALL IS FOR BOYS**			
THEME 9: **SCHOOL ACTIONS CAN SUPPORT CHILDREN'S PHYSICAL ACTIVITY IN THE OUTDOOR ENVIRONMENT**	*Sub-theme 9.1* *Accommodation needs to be made for poor weather conditions*	*Sub-theme 9.2* *Equipment and Facilities need to be provided to exploit full potential of the outdoor environment for PA*	*Sub-theme 9.3* *Adequate cycle storage is needed to encourage active transport*
	Sub-theme 9.4 *Access to space needs to be facilitated*	*Sub-theme 9.5* *Outdoor space can be partitioned to allow more children to access opportunities for PA*	

Table 4.10: Factors that might influence physical activity in the outdoor environment: Themes

4.4.2.1 THEME 1: SPACE ENCOURAGES PLAY

When asked what in their school outdoor environment might encourage young people to be active, over half of the adults spoke about the size of space available. One adult responded by saying, *' …I think the extensive grounds we've got here, they're a big part of it...'(A1S3)* and another thought that they *'….were quite lucky to have big grounds...'(A3S2).* Some participants mentioned reasons why a big space was useful such as '…*to spread out….' (A2S1)* and *'…so they can run around….'(A4S2).*

Jacob explained how the field at his school had *'... a bigger area...no-one's cramped [like]in the playground...everyone's spaced out...'* When asked about his ideal playground, James stated, *'…..first, I'd have probably a big area to play football….'* and this sentiment was echoed by others such as Frances who expressed a desire for a *'…big field…so kids can spread out…'* and Oliver who liked the idea of having *'…plenty of room to do what we like and play our games...'* However, having a field that was perceived as *'…too big…'* was worrying for two children and for others, a large, empty space was considered to be dull and boring. Sam expressed concern that *'….There's nothing there apart from grass…'* and Cole explained that *'…there's no sports stuff...like no football goals or anything...like climbing frames...or hockey pitch or just like slides and stuff…'* When asked how the open space could be improved, Andrew suggested that he *'….would put more active bits on it….'*

4.4.2.2 THEME 2: SAFETY CONCERNS ARE A BARRIER TO CHILDREN BEING ACTIVE OUTSIDE

A concern for safety ran through all of the interviews, impacting on all aspects of school provision for PA in the outdoor environment. Children and adults considered, for example, the implications of football and other ball games in their outdoor spaces. Sean explained *how '...some of the other footballers boot the ball and sometimes it goes over the fence and hits people in the face…'* and Liam thought that *'…when they're playing basketball sometimes it goes flying and it hits people...'* As one teacher pointed out, the consequence of this was *'…if you don't want to be hit by a ball you stay away from that area...' (A9S1)*

Safety concerns were also evident when considering other uses of the school grounds. For example, one participant described how children were not allowed to use the local *woodland '…because of the potential trip hazards…trips, falls…all sorts of disasters... '(A5S1).* He voiced his opinion that *'the risk assessment side of it is so difficult to do... '*

Another adult explained how energetic games could only be played when sufficient space was available due to the heightened risk of injury caused by a crowded playground: *'...they'll play bulldog...but again...that's in the Summer when we can use the grass...cos then less accidents happen...less collisions.' (A3S2)* Others commented on problems associated with bad weather which might be cause for concern as in the following example: *'...if it's really wet, the playground's...the surface is not particularly brilliant...it can be very slippy...' (A12S4)*

Concerns about safety during games and when using equipment came up regularly during conversations with the children. One child explained how *'…if you're all running, then you could bash into each other and fall over….' (Serena).* In response to a picture of a climbing wall, Rose commented, *'…I don't think that'd be safe…'* and Liam thought that a climbing frame *was '…dangerous...I wouldn't like to do it.....could fall off and bang your head on the floor or something...'* Serena thought that a piece of wooden equipment would be dangerous because *'if you run into it, you could drag your hand down it and get splinters…'*

In contrast, some children talked about their desire for challenge and risk in the playground. Hannah, for example, looking at a picture of a climbing frame explained that she preferred it to the equipment already at her school because it was *'a bit higher'* and Mel, in response to the same picture, when asked if she would like to go on the climbing frame, replied, *'…Yeah, I would because I like taking risks…'.*

Some rules meant that certain active behaviours or opportunities to be active were banned or limited perhaps because they were perceived by adults as being too conducive to injuries: *'...they're not allowed to do cartwheels and handstands and roly polys and that sort of thing...it's quite limited what they are allowed to do like so I mean dobby was stopped for a while and it's sort of creeping back in ...' (A17S2)*

One girl reported that she was allowed to do cartwheels on the grass in summer time although she explained that children were *'only allowed to do simple stuff.' (Hannah).* Sean described how he had been stopped from using equipment in the way that he would have liked to have used it: *'On the Class 1 area, it was our turn to go on it today and we weren't allowed to push anyone around on the toys that you can ride on ...they told us off for pushing them...'*

4.4.2.3 THEME 3: CHILDREN'S PHYSICAL ACTIVITY IS INFLUENCED BY PEERS

Several children reported how their PA was somehow dependent upon what their friends or peers are doing. For Nye, playing football or any games on his own *'... would just get boring but with friends you can carry on doing it with them...'*. Max liked the encouragement offered by fellow pupils:*'...it helps me when my friends say...you can do it...and when I've done it they give me a pat on the back and everything...'*

One girl, however, described feeling peer pressure during physical activities with class-mates. She did not like being the goalie in case she missed the ball and the *'.... whole team is going to take it out on you for not seeing it ...' (Mel).* Members of staff also commented on the possibility that children might feel inhibited in the presence of their peers: *'...some kids...they might not want to make a fool of themselves....especially in the older years so they might not want to play if they don't know what they're doing ....'(A16S4) '....the older girls, they don't want to be seen like they're skipping or with the hula hoops....I think it's more of an image thing than anything else…'(A14S1)*

A few children talked about the qualities they would like to see in children who could be in their perfect space: *'...people that would enjoy playing it and know what to do…and....fair...' (James) '... Good people, honest....' (Leon) '...I'd have the boys that are good at sport in there...' (Serena).*

SUB-THEME 3.1: ANTI-SOCIAL BEHAVIOUR IN THE PLAYGROUND DETERS CHILDREN FROM BEING ACTIVE

Across the four schools, children consistently stated that they would not like to have children in their perfect play spaces who would disrupt games, cause upset or hurt other people. Words and phrases used to describe unwanted companions were those such as *'…bullies…' (Sam), '…naughty…'(Max), '…vicious and nasty…' (Andrew) '…people who are big-headed…' (Serena)* and people who would *'…ruin the fun in it…' (Sam)*. Liam was happy to have people in his play space *' ...as long as they're not annoying me or anything...and messing up the games...'* Leon described how some children *'... call people names....they kick em.....hit em....push em....tell people...things that they didn't do and it's just not nice.'*

Some children spoke about behaviour rules and messages which had been established to counter anti-social behaviour such as *'.no bullying…' (Felicia), '…keep your hands and feet to yourself…'(Max), '…not allowed to play fight…' (Chelsea)* and *'… being nice to your friends and make everyone join in and help them...' (Oliver).* Consequences for behaving inappropriately were also outlined. Children were sometimes banned from playing games if arguments were becoming too frequent. Further sanctions included missing playtimes or seeing the head-teacher who might *'…decide what punishment… like they can miss four weeks break and that' (Max).* The issue of children behaving badly towards each other was not seen as a problem by one adult: *'...we're very nurturing here...we have very little behaviours or very little conflict......' (A6S3)*

SUB-THEME 3.2: CHILDREN HELP OTHER CHILDREN TO BE ACTIVE THROUGH DEFINED ROLES

In all four schools, adults and children spoke about positions of responsibility that could be held by older children in the playground such as 'sports ambassadors', 'sports captains', 'play leaders' and 'buddies.' Their role seemed to have three components, the first of which was to encourage children who might be feeling left out in some way to join in with playground activities. To address this, one school had 'Play Leaders' to *'...make sure everyone is enjoying themselves...and start... some new games if someone's stood on their* *own... ' (A1S3).* Cole's perception of play leaders was that *'.... they help save people...who don't have people to play with... and they could cheer you up...'(Cole).* 'Buddies' did a similar job and were recruited because *'... some children don't like to participate in games so the Year 6 buddies…go and find children like that to encourage play... you find a lot of them more focused when it's all set up and done for them...it also combats bullying...' (A3S2)*

A second function of playground leaders was to enable more children to play constructively by providing structure and role-modelling. At one school, there had been a feeling amongst the staff that the younger children did not really *'…know what to do...with the equipment and that kind of stuff…' (A9S1).* Children in the older year groups had been appointed to the role of 'Young Ambassadors' who *'…run events, training, activities for children at some lunchtimes, break times....after school possibly...' (A9S1)* Frances described her role: *'…this year they've tried to get us as young sports ambassadors to set up games during break time like sports games so like kids are not being as like violent during break...'*

Young leadership roles were also offered in schools to develop leadership skills and to provide a channel for some children to direct their energies more positively. 'Lunchtime leaders', for example were thought *'…to keep them focused...especially some of the children who struggle...it kind of turns them around...so even though they might get into mischief... they do the playtime leader scheme and it helps them as well....' (A3S2)*

4.4.2.4 THEME 4: ADULT PRESENCE AND INTERVENTION SUPPORTS PHYSICAL ACTIVITY IN THE OUTDOOR ENVIRONMENT

When children were asked who they would like to have in their perfect play space with them, most children thought that adults were needed in a monitoring capacity for helping to maintain a calm environment and to make sure that equipment was used fairly. For example, Frances wanted to *see '... a few teachers on the playground just to....make sure that everything's going all right ....',* and Daisy thought that *'... children can't always get other children to calm down and behave...and adults know how to do that in a proper way...'* Adults were needed *to ''... make sure everyone's playing nicely and everything's sensible...'* according to Dane and Jacob explained how *'... sometimes it gets a bit unfair and people like* *hog the ball in football...you need teachers to say pass the ball so it makes it fair for everyone to have a go...'*

Some children described how they liked adults to be present in the playground *'…to make you safe and all that...' (Oliver)* and so that *'... no-one's getting hurt or no-one's being picked on...'(Ula).* Children liked to feel that there was someone around should the need arise for injuries to be treated or disagreements to be sorted: *'...somebody…like a first aider...um....somebody that's there to help to sort out situations.... I'd get somebody to come in and help me if there's something bad that's happened...a falling out.' (Serena)*

In answering questions about the role of adults in the playground, children and adults thought that facilitating and encouraging were two specific functions of the adult supervisors. One participant described how *'...it's up to each individual mid-day to get stuff out...they'll put a pile of skipping ropes and then the hula hoops...' (A14S1).* Dane reported that '*...some of the lunchtimes last year used to do skipping...hold the ribbons…it's mostly the lunchtime supervisors that join in with…games...*' Other participants talked about how *'...the dinner ladies encourage them to play with the equipment…'(A15S1)* and how *'…the mid-day supervisors, they're always sort of getting involved in getting games initiated...(A1S3)*. One adult talked about how *'...it's kind of the stray ones I try and pull in with different things… cheerleading....we've done that as well...so again, it's active but it's not sport based so I try and change it as much as possible...to try and cover every need really…' (A3S2)*

However, encouragement alone was not thought to be sufficient to entice all children to join in with active games: *'....if they're not motivated they're not going to want to do anything...as much as you want to encourage them…' (A17S2) '....certain kids... you don't really need to tell them to be sporty...but certain kids need a bit more persuading...and I think that's important.... to encourage them...' (A16S4)*. During lesson time, too, adult encouragement was seen to be important: *'...he got her involved because he just kept saying come on, you can do it....and in the end, she was jumping off the blocks and enjoying it...' (A11S4)*

Adults and children talked about activities being provided by outside agencies, sometimes at lunch-times or before school. External providers were seen as popular: *'... the lady that does wake and shake....she goes out on the playground at dinner time and the kids are swarming round her….' (A17S2) '… they come in and deliver specialist sports...and [now] that lunch time area is always packed compared to what it used to be...' (A16S4) '…We have active people that come in and get people enjoyed so they can be more active….' (Andrew)*

SUB-THEME 4.1 THE OUTDOOR ENVIRONMENT IS A SPACE TO DEVELOP INDEPENDENCE

While there was considerable support for the idea that adults played an important function in encouraging children to be active in the playground, not all children wanted adults present with them outdoors. There was a view that there might be a role for adults being there for younger children but *'.... like in Year 5 and 6 it doesn't really matter.....it's nice to feel that responsibility for yourself sort of thing....' (James).* Other children wanted to be left to do what they wanted without having to comply with rules or requests. When asked if there would be any adults in her perfect playground, Chelsea replied, *'…No....my rules...no teachers....do what you want....there's only one rule really...there are no rules...'* She described how teachers spoilt her fun: *'.…we all started this game and then a teacher came up and she said right guys, stop play fighting because it's wrong…'* Sean talked about wanting to do *'…what I want....'* He did not want adults to *'… boss me around or anything…' unless it was '…for their safety…'* Sean thought that he could work out for himself what was safe.

One adult thought that having adult-led games was more important for younger children because the older children *'… prefer to just do their own thing....'(A13S4).* Another participant thought that *'…a big point of a playtime is that it's a great opportunity for children to go and have those....unstructured times which are really important for children to feel that they aren't restricted...and if there's relatively few rules or areas that are out of bounds or things like that… it adds to their feelings of control...and self...and making their own decisions so I do think it's important…' (A5S1).*

4.4.2.5 THEME 5: EQUIPMENT PROVISION FACILITATES CHILDREN'S OUTDOOR PHYSICAL ACTIVITY

During the picture activity, children frequently chose pictures showing different types of loose and fixed equipment as being ones that might encourage them to be active and adults and children spoke about availability of fixed and loose equipment in the playground as being related to children's PA. Increasing equipment availability during breaks was thought to be making a difference to PA levels by this participant: *'…when you give the children a lot of good equipment to use...lots of different things to do.....it's amazing.....most of them are busy...it's not just the usual running around like headless chickens...' (A13S4)*. However, one adult commented on the practical difficulties associated with providing this kind of equipment at break time: *'…it's just the management of that...you've got to get this stuff out...you've got ten minutes....fifteen minutes of break time...so there's the time problem with that…...you've got to put them back so...and as a school we haven't got that much space anyway...so it is quite difficult…' (A9S1)*

Other adults thought that their schools would benefit from installing some fixed equipment into the playground such as in the following extract: *'…I think they need play equipment... I think our kids would benefit from that...' (A7S2).* Max wanted *'…loads of little equipments...like swings and that…'* in his ideal playground.

SUB-THEME 5.1: DESIGN OF EQUIPMENT IS IMPORTANT TO CHILDREN

Some children specifically commented on design features of equipment that appealed to them. When asked what his school could do to encourage him to be more active, bright colours of playground equipment appealed to Jacob: *'...like that wooden one...like bright blue, yellow, orange...bright colours so it stands out…'* Max described the materials he would like some replacement items to be made from: *'...I would like them to be put back up again… not like wooden where....people could just destroy...they could be like metal...'.* He also mentioned how he *'wouldn't have...chains again where the swings were cos a few years ago, someone got their leg caught in them...'* Jacob talked about his preference for certain materials in play equipment when viewing one of the photographs: *'…Yeah...it looks a bit wooden and I like things that are like wooden...'*

Some children commented on the height of the equipment. Hannah, Chelsea and Max, for example, in response to the picture of a climbing wall, said that they liked it because it was higher than the ones that they had in their own playgrounds. Another child criticised the size of a large slide saying, *'…I don't know if you would really have that at school...because it would be too big and you wouldn't have room for anything else if it was in the middle...' (Cole)*.

SUB-THEME 5.2: AVAILABILITY OF EQUIPMENT AFFECTS MOOD AND BEHAVIOUR

Adults and children mentioned instances where presence or absence of equipment affected children's behaviour and mood, thus affecting their PA. The introduction of a selection of loose equipment had had *'a massive impact on what dinner times are like...' (A12S4)* at one school where playtimes were *'... much smoother now because there is more for the kids to do so....we have less falling out....less of children not really knowing what they're doing....' (A10S4)*

The recent removal of fixed equipment from another school was thought to be having an impact on children's behaviour and safety issues in the playground. One adult thought that children's behaviour had deteriorated since the removal of monkey bars: *'…there's been a lot more fighting outside [since equipment removed]...'(A7S2).* However, other staff from the same school viewed the situation in a different way, suggesting that there had been more accidents before the equipment was removed and that there were now fewer first aid issues because there used to *be '…lots of pushing and shoving…' (A4S2)* and children *'…twiddling over the monkey bars…' or '…standing too close…'* causing others to get *'…caught under the chin or something…' (A3S2).* Children also differed in their opinions of the changes: *'...we always used to play on the monkey bars but now it's kind of boring...' (Chelsea)… 'we used to have monkey bars but…we just have a flat field now but it's really fun as well…' (Mel)*

Equipment was placed on a rota system at one school to prevent boredom so that there were *'…different activities for every day…' (A11S4)* although seasonal variations were seen to have an impact on children's mood as they couldn't *'… do the parachute in winter or anything so it's like they do get bored and on windy days it's even worse…' (A7S2).* Oliver complained that when it rained, children couldn't play football so consequently, they had *'.... nothing to do…'*

4.4.2.6 THEME 6: VARIETY OF PROVISION FACILILTATES PHYSICAL ACTIVITY FOR MORE CHILDREN

Many participants spoke about the different ways in which children were inspired and motivated to be active resulting in a corresponding need for variety as in these examples:
'...some children...rather be on a climbing frame than playing a circle game and you've got others who'd rather play parachute than be on a climbing frame so you can't say….' (A3S2)
'... if people don't like sports, you can just go on trim trail and still be active..' (Dane)

In response to being asked what else her school could do to encourage children to be active when they are outside, Mel responded: *'…um...get another playground....instead of three football pitches......with equipment on….like slides...some of the children don't like to play football...'* Two boys also thought that it was important to have alternative options to football available: *'... If you play football...every day…sometimes it gets a bit boring so you may just go and play like something else like go on the climbing frame…' (Cole)*. *'…I don't play football and stuff with the other kids cos I don't really like football but I do play with my other friend that doesn't like football too and there's some scoops and a ball and throw it to each other and play catch....' (Liam).*

The desire for variety was also voiced by some children when looking at a picture of a large, empty space. Sean said that he would *'…like more stuff in it...like a football area, bike shed and everything...'* and Jacob described a field in the following way: *'…I would say it's pretty dull...if it had...like a different colour floor or somat....it would look good …..I would put a goal post or somat...'(Jacob)*

SUB-THEME 6.1: VARIETY OF SPACES TO SUIT INDIVIDUAL PREFERENCES FACILITATES OUTDOOR PA

Most of the adults mentioned particular areas of their school's outdoor space which they thought were important for children to be active such as in the following examples: *'…We have lots of different areas... we've got the garden, the trail, the different surfaces...I think they all help...' (A1S3.) '…We are very lucky in the fact we have a field, we have areas of woodland, we have two hard surface areas … (A5S1)*

Children described the kind of place they chose for play in their actual playgrounds and some of the spaces they would like to see in their perfect play areas. Mel talked about how she and her friends '…*always go down to the bottom playground… instead of staying at the top....cos all the bottom playground is all new...' (Mel)'* and Chelsea liked to play on *'...the bottom path....because um we play this… Ninja game...' (Chelsea)*. One child was very clear about the specific spaces she would like so as to cater for all tastes: *'...I'd probably have something for everybody...so there would be like different sections...like um coned off so one for football and one for basketball.... so I'd have a small section for like skipping, hula-hooping and anything fun and active like that...' (Serena).* In Leon's playground, *'…one space would be about hula-hooping and another bit would be about basketball skipping, football and all that lot…'*

Whilst spaces were often spoken about with respect to their potential for PA, some participants also mentioned areas where children could relax, away from the bustle of the main play areas. One adult commented on an section which was slightly tucked away, which children could use if they wanted to get away from the main playground area for *'…a bit of quiet time…' (A12S4*) where there were play houses and other play items. Another adult described a covered area which could be used in bad weather as a *'…chill out area…'(A9S1).* One child, when asked about the components of her ideal playground, suggested that it should contain a *'…chill-out room…' (Rose),* and Ann spoke about having *'…a little outdoor library with a cover over the top…'* Frances described the space where she and her friends liked to sit: *'….there's like this little seat bit and we all like to sit down and like talk while we're doing it...'*

SUB-THEME 6.2: GRASSY AND NATURAL AREAS ARE POPULAR SPACES FOR PA

Grassy areas such as a field and wild areas were mentioned by several participants as being enticing to children: *'…I guess the most obvious things that I hear all the time are the wild area...the wildlife area…' (A10S4)*. *'… if it's not raining, we all prefer to go on the field…' (Dane)*. One adult talked about the school's *'…pond area' as being a 'fantastic space…' (A9S1)* and another described the *'…hilly areas that….the children love….sliding down……more than the climbing…'(A2S1).* A third participant mentioned *'…the doughnut….it's a big circle of grass...(A4S2)'* in which the children sit and play games. One child picked out a picture of *'…a forest…'* as something that might help her to be active and described the reasons for her choice: *'…You can build things in there....shelters....we do forest skills and that's fun…' (Felicia)*. Others said that they *'…liked climbing trees…'(Sam, Chelsea)*.

The field was preferred by some children as it was perceived to be safer as described by Cole: *'... when you're on the grass……you can mess around and if you fall over, it won't like be a serious injury cos it's grass and it's soft...'* and Rose; *'when you're on it and you fall over, it doesn't hurt so much....'* Frances liked it *'because it's bigger and it's.....softer and cos the boys like getting mucky as well with the mud...'* In contrast, one child explained that the reason he didn't like playing football on the grass was *'….because the grass sometimes is wet and it just doesn't feel right cos it's really long…' (Jacob*).

SUB-THEME 6.3: OUTDOOR SPACE NEEDS TO BE TAILORED TO SUIT CHILDREN OF DIFFERENT AGES

Equipment use was thought to vary depending on the children's ages. There was a view amongst some adults that *'….the older the children get, the less they play on that equipment.' (A10S4).* One participant described how the younger *children ' ... like bats and balls...'* and are *'more into throwing games with the soft balls and things…'(A1S3)* and using the climbing frame than the older children who *'are running about.'* Another adult thought that *'…the younger ones aren't really bothered [about football]...they just take a ball out just to kick it...they don't play a game…'(A4S2)*

One member of staff described the different ways that children of varying ages used the same piece of equipment: *'…it speaks to different kids in different ways so they use it in different ways… ...depending upon the age of who uses it...some use it appropriately for what it was built for...some use it just to sit down and have a chat...some will stand there and swing or tie from...themselves to their friend over there....' (A16S4)*. Another participant speculated on the reasons why children stopped using the equipment: *'…the little ones...they do like to keep active...but I think girls hit ten and they just don't want to be seen like they're skipping or with the hula hoops....I think it's more of an image thing than anything else...' (A14S1)*

All four schools provided designated areas for Early Years and Foundation stage children and two schools had recently invested heavily in these areas. One school also provided an outdoor area to cater for the transition between the Early Years stage and Year 1. On occasion, those areas and the equipment in them were sometimes made available to older children on a rota system. Adults described how these spaces were accessible to younger children throughout a large part of the day as an integral part of their academic and physical development: Physical development, for them, was seen as *'…the starting block for a lot of other areas…' (A12S4)* and was given a higher priority.

4.4.2.7 THEME 7: PHYSICAL ACTIVITY IS ENCOURAGED THROUGH OPPORTUNITIES FOR OUTDOOR LEARNING

The outdoor environment was seen as a useful space for children to access the curriculum and, for younger children, to *'….explore appropriate learning at any time they want...'(A5S1).* Although a few opportunities were given to older children to have lessons outside, there was a view from some adults that '…*the further up school you go the less outside is provided for...'(A12S4).*

One participant described how his school were trying to promote *'…incidental physical activity…'* through encouraging all children to be aware of their natural environment by gardening, planting trees, using the pond and forest skills. He talked about the programme that was going to be made available to all pupils: *'....the plan was that every child would*

have done a forest schools session by the end of this year...'(A5S1). Another adult also described how PA was being promoted in different ways at her school:
'…they don't all have to be sporty...but they can be active so there's lots of things going on ….at lunch, small groups that I've got going...I've got bio-club going...I have a gardening club so it's all very active but all very different….' (A3S2).

The outdoor environment was also perceived as supporting the delivery of the curriculum in an active way. One participant, for example, described how the school was *'… looking to try and add a physical aspect to our times tables...'* by having *'…all the children in the school in mixed groups actually chanting a times table....in the playground... accompanied by physical movement...' (A10S4).* Some children enjoyed working outside and commented on *the '…fresh air and lots of space...' (James)* and the associated freedoms: *'I enjoy it because we don't get to do it in books…' (Oliver).* Other pupils mentioned competitive strategies which had been implemented to encourage them to be active through relay races while they were learning literacy and numeracy.

Some adults reflected on practical and academic issues associated with outdoor work. One thought that *'...it's not always the easiest thing...it takes a bit more effort than usual...so I'd say...as a school we don't do as much as we should do outside….' (A9S1).* There was also a view that *'…it's not always that easy... and I don't think it's done as much as it could be...you definitely see it more in the Spring and the Summer...' (A12S4).* The benefits of outdoor learning were questioned: *'...we did have a big thrust on outdoor learning a couple of years ago but what I think we were in agreement was is actually, it's all about what the benefits are...so if there is um you know an actual point to it rather than just going out to say we've been outside....' (A10S4)*

SUB-THEME 7.1: OUTDOOR PE ENHANCES CHILDREN'S PHYSICAL ACTIVITY

PE was frequently mentioned by adults and children as a curriculum subject that was taught outside in suitable weather and a few adults and children thought that having more PE outside would encourage children to be more active. One adult liked having the additional space that the outside grounds offered: *'…I had some kids inside with me and I sent my* *assistant out with another set just so they can go outside and had a bit more room...it works really well…'(A9S1.)*

Some children described why they like doing PE outside and offered reasons such as *'…more/plenty of space…' (Daisy and Oliver), '…it's fun cos you can like do sports and you're not always stuck in the classroom doing work so you can get outside and run around…' (Cole) and '…fresh air…' (Dane)* for their preferences. A small number of children did not like outdoor PE. Sam gave the reason as being *'…I like inside a bit better...there's less room and it feels easier to play around,'* whereas Sean's reason was *'…I get really muddy and I don't like muddy....'*

4.4.2.8 THEME 8: FOOTBALL IS FOR BOYS

Football was reported to be a predominant game played at all four schools and because of its need for a large area of space, those not playing, often girls, were sometimes left with little space for other activities. Football was mentioned overtly or implicitly by several children as being mainly for boys: *'...all the boys love doing football... (Frances.) '...I also think football is a really energetic game for boys mostly but girls can do it...'(Mel)*

Some adults also noticed differences between boys and girls in games they played and recognised the place of football in the playground: *'..so there is still that divide that boys should play football and girls shouldn't....some boys do play with hula hoops and that but it's mainly the girls that play with them....so it's still quite divided on...that's a girly game...that's a boy game...' (A17S2)*. *'…[the field is] taken up by the football and then generally the girls will just do a bit of gymnastics or kind of handstands and stuff round the side…' (A9S1). '…I would say in the majority the girls are doing the wandering around and chatting and talking or the trim trail….The boys are the more games side...the footballs...the basketballs...' (A2S1)*

When asked what girls preferred to do instead of football, other participants stated that girls *enjoyed '...chase and dobby…' (A7S2), '…hula hoops, skipping...'(A4S2), '… to sit and chat...you know....gossip…' (A4S2).* Girls were also said to *'… pretty much make their own games up…' (A8S2) and '…stand (or sit) around and watch the boys play football or* *basketball...' (A14S1; (A7S2))*. Girls were said to like tag rugby because *'...tag rugby is for boys or girls…' (A3S2).* Basketball was also seen more as a game which could be played together by boys and girls; *'... we'll play basketball like girls and boys together...' (Frances)*. One participant suggested how girls might be encouraged to join in with football more: *'...if you make it fun...and not about winning which is sometimes what I do with the girls...you're gonna get enjoyment and they're gonna do it....'(A16S4).*

Some boys seemed to feel a kind of ownership over the game and explained how they would allow the girls to play: *'...when we play, the girls can join in if they would like to...' (James)*. *'... sometimes we let them join in if they want to...' (Oliver)*. It seemed that girls could earn acceptance on the football pitch if they were thought to be good players: *'... if it's a good girl playing football then she can play....if it's a girl that's maybe not so good then they'll say no you can't play...' (A17S2)*. *'...some girls are really good at football.....especially we've got a girl in our class that's really good at goal-keeping.......there's a couple of boys in our class that can't even kick the ball...they miss the ball....so it's better to have mixed teams so it's fair...' (Jacob).*

4.4.2.9 THEME 9: SCHOOL ACTIONS CAN SUPPORT CHILDREN'S PHYSICAL ACTIVITY IN THE OUTDOOR ENVIRONMENT

At all of the schools, participants identified aspects of the outdoor environment which could be improved in some way to encourage children to be more active when they are outside. However, some participants thought that the scope for making changes and improvements was limited by financial and logistical constraints: *'I think there's always more that you can do....it's having the time...the finances...the people.......and that's the key....' (A11S4).*

SUB-THEME 9.1: ACCOMMODATION NEEDS TO BE MADE FOR POOR WEATHER CONDITIONS

At all four schools, policy on what to do when the weather was bad at playtime was consistent. Children were expected to play outside until the weather conditions were extreme. However, some adults observed differences between children's level of activity at different times of the year: *'...you get more kids outside and using the outdoor area effectively...probably in the Summer than you would do in the Winter...(A11S4).*

Adults reported that some areas of the school grounds were off limits to the children in harsh weather conditions at break times, particularly because of the problem of mud being brought back into school and accidents caused by slippery surfaces. As a result, use of the field was often seasonal and weather dependent: *'…obviously in Winter when it gets really muddy and boggy, it's difficult to go on the on the grassed area but certainly, whenever it's dry or in the Summer months, that's used all the time...' (A6S3)*. *'...if like it's raining, we can't go on the field...cos it would be really muddy...' (Dane)*

To counter the effect of poor weather conditions, some schools utilised facilities or equipment to ensure that children could still be active regardless of the situation outside. Alternative outdoor play spaces were used where possible: *'We just use that area there more with the cover....there's lots of games that could be played under there...when it rains...'(Ann)*. *'…if you're doing science, and it's raining, then you might be able to do it in that sort of enclosed area...' (A6S3).*

At another school, outdoor clothing was made available so that children could be active in all situations: *'...we have wellies...we have overalls, we have everything...there's nothing to stop us going outside...we don't let any of the... elements beat us unless it's minus 15, snowing like a blizzard...'(A13S4.)*

As a solution to the problem with mud and slippery surfaces in green play areas, two schools had invested in alternative multi-weather surfaces such as astroturf to stop the weather from creating so many problems. As this participant explained: *'...we're... putting more multi weather surfacing down so that areas…that were grass and tended to go to mud, are now the soft, rubberised areas….the plan is every couple of years to do another area because the cost of it is fairly prohibitive…...there won't be the mud issues for the parents...it'll make it easier for children to get out when it's raining,…so...their activity isn't being hampered because there's a slight drizzle in the air….' (A5S1).*

SUB-THEME 9.2: EQUIPMENT AND FACILITIES NEED TO BE PROVIDED TO EXPLOIT FULL POTENTIAL OF THE OUTDOOR ENVIRONMENT FOR PA

Some members of the school communities identified equipment or facilities that they thought would be beneficial for children's PA and which were currently unavailable . One participant talked about how there were *'…some now fairly faded lines on the floor that we've got to re-do at some point…' (A5S1)* and when asked what could be done to encourage children's PA further, these participants responded as follows: *'…we asked for like you know in some playgrounds they've got the paint sprayed...they've got the hopscotches and they've got wiggly worms as people call em and they was going to get done but they're not been done just yet and we've been waiting a few years now...(A14S1)*. *'…There has been talk in the past of maybe a traversing wall or something for the older children but I suspect budget restraints affect things like that...' (A10S4.)*

In some instances, children described how they were not able to do activities that they might like to do because equipment was not available or, perhaps, not acceptable within school policy. For example, Hannah described how the portable basketball net at her school was *'…stored in the shed…'* and needed to be taken out for children to be able to use it. Other children also mentioned instances where a lack of equipment left them unable to enjoy the outside space fully: *'...and then the basketball court...but they don't play basketball...they just play football on it because we don't have no basketballs...' (Max)*. *'...well, I think they could do with cricket posts and everything...I'm not the only one that loves to play cricket. I've got loads of my friends that like to do it as well..' (Daisy).*

Dane reported that although the younger children at his school had plenty of loose equipment available for playtimes *'...there's not really that much things for Key Stage 2…'*. Ann also described how the adults did not *'... always get the play things out of the shed on rainy days.'* She thought that *there '…should be certain equipment that can be allowed…when it rains...'*

SUB-THEME 9.3: ADEQUATE CYCLE STORAGE IS NEEDED TO ENCOURAGE ACTIVE TRANSPORT

On-site cycle storage was seen as important by adults and children for facilitating children's activity before and after school. However, this was not always provided. One adult reported, *'…we don't have facilities for locking up cycles which is a shame because I know a lot of kids would cycle to school if they could…'* (A10S4). Another explained some of the problems associated with having cycles at school: *'…if they go missing that causes problems...they was either losing the key or you know or they was getting flat tyres or something so I think they decided it was too problematic in primary school....'* (A3S2).

Some children were concerned about the security of their bikes and other property on school premises where they perceived that there were inadequate storage facilities: ' *…we've got a bike lock where you put your bike on but most people don't bring bike locks so they can easily get robbed.' (Felicia). ' …I don't really feel safe leaving my bike or my scooter or my skateboard here...so...I just walk...' (Liam)*. A member of staff at one school explained how: *'…the School Council have been asking for years [for bike storage] since I first came here and it's only this year when a parent wanted to bring a bike and there was nowhere really safe for us to keep it....so then it was raised about we need a proper bike stand and which finally has been agreed...' (A12S4).* She considered the reason why bike storage had not been implemented before: *'…Cost I think more than anything...but now we have the sports funding in place we could utilise it in that way because it is encouraging children to be more healthy which is part of the sport's funding...' (A12S4).*

SUB-THEME 9.4: ACCESS TO SPACE NEEDS TO BE FACILITATED

By using rota systems, schools made sure that all children had access to certain spaces and opportunities. Staggering break times also reduced crowding in play areas: *'We have...a lunch time rota so each year group can come and do a lunch time club in our football area...' (A16S4)*. *' ... they have split lunchtimes so...there's not too many children fighting for the same balls or basketballs or trim trail... ' (A2S1*)

Some participants commented on how splitting playtimes helped to reduce accidents and to keep younger children safe. Frances thought that when all children were in the playground, *'… it would… be a bit boisterous for the older ones and the younger ones playing together'* and Rose explained that with a rota, *'…it's more safe....people don't get hurt as much …'* One staff member noticed changes after the introduction of a split lunchtime break: *' ... we haven't got the big ones running rowdy on the little ones...we don't get any of that any more… ' (A14S1).*

SUB-THEME 9.5: OUTDOOR SPACE CAN BE PARTITIONED TO ALLOW MORE CHILDREN TO ACCESS OPPORTUNITIES FOR PA

To address the disruptive effect of football and other team games in the playground one strategy that schools used to address the situation was by dividing the outside areas so that football and other team games were given adequate space and separated from other activities: *'… then we've got the two playgrounds…one playground...generally will be football...then we've got the other playground which is no footballs allowed...'(A9S1)*. *'...I kind of do like a zoned area...so zone 1 might be the football pitch, zone 2 might be mixed games with groups or zone 3 might be the sand pit..' (A3S2).*

Children described how they would organise the playground to protect younger children and to avoid accidents: *'... I'd put it separately so the older children can't bash into the other children…' (Ula)*. *'...I think you need to scatter it out as well...cos if it's all in one place, you're just going to crash into each other...' (Cole).* Sean suggested the possibility of '*a larger fence or something to stop the ball from going out of the net area...'*

4.5 DISCUSSION

The aim of this study was to investigate adult and child perspectives about what aspects of school provision might encourage or discourage children to be active outside with a view to understanding better the barriers to and facilitators of children's PA in the primary school setting and to inform the development of a survey for primary schools about the provision they make for PA in the outdoor environment (See Chapter 5).

Content analysis showed that some items of loose and fixed equipment were thought to be particularly important for facilitating children’s PA, namely trim trails, climbing equipment, skipping ropes and hula hoops. Football was also considered by many of the participants to be a game which could keep children active. Of the many strategies put forward aiming to increase children’s ATS, cycle storage was one which was considered by adults and children to be particularly important. In the thematic analysis, nine overarching themes were identified, with 6 of these having at least one sub-theme. Theme 1 (Space encourages play), Theme 2 (Safety concerns are a barrier) and Theme 6 (Variety of provision facilitates PA) were found to be strong patterns in the data. The themes will be discussed in turn in relation to previous research.

In theme 1 (Space encourages play), aspects of space were considered by most adults and children to be school environmental factors that might encourage children to be active. The perception of space, either of the physical dimensions of the school grounds, its availability, according to space per child, or accessibility were mentioned as being salient for encouraging children to be active. Participants referred to large, open spaces as being significant and this perception of the actual size of the space as being important for encouraging children’s PA has been described by other authors. Harten et al (2008) reported, for example, that absolute play area was strongly related to boys’ PA and Eskola et al (2018) summarised children’s perceptions as *‘a lack of space decreased enthusiasm to run and play.’* It could be that there is a sense of freedom offered by open playgrounds and fields which inspires children to move around and sufficient space to set up preferred games. Equally, adults and children in the current study talked about children needing enough space to play without feeling crowded or cramped which is a condition that is more easily accessible in larger spaces. A positive relationship between the amount of space available per child and PA has been shown previously (Van Kann et al, 2016) although the converse has also been found (Pereira et al, 2020).

Although schools may not be able to expand the absolute amount of outdoor space available, they can try to ensure that the space they do have is accessible to children since schools can sometimes restrict access and being unable to access space has been found to be a barrier to children's PA. School rules which prevent children from playing in certain areas, poor condition of areas, conflicting priorities for use of space and overcrowding of play areas (Caro et al, 2016; Pawlowski et al, 2014) are some of the reasons that have been found before that might stop children from using parts of their play spaces and participants in the present study also reported these barriers.

A second theme (safety concerns are a barrier to children being active outside) woven through all interviews reflected concerns about safety and risk. Children were worried about being hit by footballs, about safety features of equipment and about injuries resulting from collisions or slippery surfaces. Some children, however, were less focussed on safety concerns and sought actively to incorporate more risk into their play. In the content analysis, too, it was evident that children were keen to note their interest in climbing apparatus and some highlighted their desire for the challenge of height.

Although there is evidence to suggest that there are quality of life, health and social benefits associated with more risky outdoor play (Brussoni et al, 2015; Niehues et al, 2013) and that overcoming a level of danger may be important for alleviating boredom and promoting participation in PA by primary and secondary school aged children (Hyndman and Telford, 2015), schools may be reluctant to introduce more of this kind of activity. In the face of official directives (Thomson, 2003) and parental anxieties about risk and fear of blame (Gill, 2007; Niehues et al, 2013; Thomson, 2003), schools have been shown to restrict activities in the playground (Thomson, 2003) resulting in over-regulated playtimes and minimal opportunities for freely directed play and challenge. Numerous news reports have picked up on a trend which shows schools banning traditional games said to be due to a risk averse culture and fears of litigation (e.g. BBC, 2011; Ellery, 2019). In the current study, some restrictions such as banning activities like ‘bulldog,’ preventing a child from being pushed along on a wheeled toy or complicated gymnastics manoeuvres were apparent. Others (Caro et al, 2016; Willenberg et al, 2010) have reported before about children’s frustration about not being able to use equipment perceived by adults to be suited for a particular age group and in the present study, too, it seemed that a valuable play opportunity was being missed when children were prevented from having fun in the way they wanted to with playground toys.

Simply increasing the level of challenge per se in the playground might not, necessarily result in measurable changes in PA (Farmer et al, 2017). Where possibilities for more risk and challenge were introduced into school playgrounds in one RCT, accelerometer measured levels of PA were not seen to change correspondingly in the intervention group (Farmer et al, 2017a) despite observations by staff members of improved behaviour, increased confidence and more PA (Farmer et al, 2017b). However, where educators and parents were given guided time to reflect on the benefits as well as the drawbacks of risky play and the opportunity to re-frame their ideas, some developed new insights (Niehues et al, 2013). Coupled with the provision of innovative play materials, these new schema may also have contributed to the success of another RCT which increased children’s PA by enabling adults to feel more comfortable about supporting a wider range of play behaviours than they might have done prior to the adult training (Engelen et al, 2013).

A third theme (children’s PA in the outdoor environment is influenced by peers**)** brought together participants’ views about the role of peers in facilitating physical activity. Friends and peers were seen by children in this study to be influential in their decision making surrounding PA at school and helped to determine how they spent their playtimes. Children found the presence of their friends to be encouraging and stimulating on the whole and spoke positively about social interactions. A positive association between peer involvement and PA has been documented before (Coppinger et al, 2010; Macdonald-Wallis et al, 2012) and children have described the positive influence on active play of other children being 'nice' and encouraging (Parrish et al, 2012) and how friends are important for having fun and being active (Caro et al, 2016; Eskola et al, 2018; Hyndman et al, 2012).

One girl described an incident in which she felt pressurised when she took part in physical activities at school and some adults also commented on situations that they had noted where children, particularly older girls, did not join in with sports or other PA because, perhaps, they felt too self-conscious or perceived themselves to be 'too old'. Self-consciousness and embarrassment as barriers have been reported previously in early secondary aged pupils (Billings et al, 2008; Youth Sport Trust, 2017) and Year 7 children have also reported that they felt that they could no longer 'play' outside as they did at primary school due to a perceived pressure to seem more mature. School culture and a sense of feeling incompetent were seen to be important factors in determining girls' PA experiences (Billings et al, 2008) and might, perhaps have played a part for the children in the current study who felt uncomfortable when engaging in physical activities. Year 6 children are at the top end of primary school and may be influenced by a wider culture percolating into school which could influence how they perceive themselves and their abilities.

The more negative aspect of peer influence including bullying and other anti-social behaviours such as pushing, being rude and disrupting games was raised in this study as in other qualitative work (Parrish et al, 2012 (Bullying), Hyndman and Telford, 2015 (Bullying/Territorial), Caro et al, 2016 (Disruption/Unpleasant behaviour). Children were clear that they did not want anti-social behaviours in the playground spoiling games and enjoyment. Peer support structures such as 'Play Leaders' and 'Young Ambassadors' were in place at all four schools in the current study and were seen as ways in which children could help others to engage in positive play behaviours and to learn leadership skills. Placing children in these types of roles is an approach that has been used with some success to tackle bullying and related anti-social behaviours in schools (Thompson and Smith, 2011) and in an intervention where peer leadership training was offered to schools alongside structured games and activities, conflict in the playground was significantly lower than in a demographically matched comparison school. In addition, participants in focus group interviews thought that children felt safer, both physically and emotionally and were more active (Massey et al, 2017). The involvement of peer leaders could also have potential for increasing children's PA (Barr-Anderson et al, 2012; Christensen et al, 2020; Spencer et al, 2014).

Theme four (adult presence and intervention supports physical activity in the outdoor environment) highlighted a pattern demonstrating that adult involvement might be of benefit for encouraging children to be active in the playground through active encouragement and practical support. Adult monitoring outside was also thought by many participants to engender a feeling of safety. A high level of teacher presence has been put forward before as a factor which enables young people to feel safe at break time and consequently able to be physically active without concern (Hyndman and Telford, 2015) and having teachers involved in initiating and directing children's games has been identified as a strategy that might be useful for minimising conflicts and increasing play at break times (Pawlowski et al, 2014). Teacher encouragement has also been found previously to have a positive influence on children's physical activity (Pangrazi et al, 2003) and by simply being present in the playground, a teacher may be sufficient for encouraging more children to be active (Willenberg et al, 2010).

However, whilst children mainly focused on the helpful aspects of teachers being in the playground, a small number felt uncomfortable about the idea of teachers directing their free time. These children seemed to resent being told what to do and reacted against safety rules. Children's physical activity has been observed in other studies to decline when teachers are observing or managing activities in the playground (Parrish et al, 2009b) and too many adults outside at playtimes has been reported as being a possible deterrent for active play (Hyndman and Telford, 2015). Having too many rules enforced by supervisors might also strongly influence the experience of having fun and hold children back from being fully active (Caro et al, 2016; Eskola et al, 2018), similarly to the experiences of participants in the current study. Even active encouragement to join in with structured physical activities has been found to inhibit intervention effects on children's engagement in LPA at break time (Yildirim et al, 2014). Eskola et al (2018) reported that children would like to be taught new games and for teachers to play alongside them instead of being controlled by them.

The question as to whether adults/teachers in the playground make a positive difference to children's physical activity is still open. Certainly, some children seem to want a high level of teacher involvement in order to feel protected and safe as they play and some seem to enjoy the direction of an adult in active games, as shown in this study. For others, perhaps those who are more confident and independent, too much adult interaction might feel like an imposition; an unwelcome intrusion into a child's world. As school break times are often valued by children as leisure periods, for those who are able and happy to fill them with autonomous activity, having a teacher dictate how that time should be used could be interpreted with some hostility. A level of tension might also exist between some children, who, in the less constrained environment of the playground strive to assert their independence and supervising adults who perceive the need to manage risk.

For adults working in schools, concerns about risk, responsibility and blame which may be drivers for behaviour management in the playground (Bundy et al, 2009) may act as curbs to natural free play. Where the culture of overly sanitising the school play experience has been challenged and children allowed to make their own play choices, with minimal supervision, children have been seen to regain opportunities to develop independence, become less bored and engage in fewer destructive behaviours (McLachlan, 2014).

Numerous types of equipment, both fixed and moveable, were identified by participants in this study as being objects or features that they thought might be facilitative of children’s PA in the outdoor environment and this provision of equipment formed the fifth theme in the data (equipment provision facilitates children’s outdoor PA). Adults and children thought that having loose equipment available for children at playtimes would be likely to encourage children to be active, a sentiment echoed by children in previous qualitative work (Parrish, 2012) and supported by an intervention study which found that children's levels of MVPA significantly rose during break times when loose equipment was provided (Verstraete et al, 2006) and observations that children, especially boys, are more active in areas where there is more loose equipment (McKenzie et al, 2010). In other work, however, only the availability of balls was found to be associated with children's VPA (Zask et al, 2001) and in a systematic review of intervention studies which set out to increase children's PA at break times, Escalante et al (2014a) concluded that the provision of games equipment alone would not be sufficient for increasing PA during break times.

As can be seen from the content analysis, the type of loose equipment spoken about was mainly 'off-the-shelf' sport equipment such as balls, bats and skipping ropes. Views about which loose equipment might facilitate PA were discrepant in some instances between adults and children. Whilst several adults and children, for example, thought that skipping ropes might encourage children to be active, a much higher proportion of adults than children thought that hula-hoops were useful in this respect. The ways in which the pieces of loose equipment were being used was not spoken about by the participants in this research. It could be that children were using hula hoops as place-markers, for instance, which may not have been perceived as 'active.'

Fixed equipment items as well were frequently mentioned as potential facilitators of PA and there is some evidence that the presence of permanent play structures is associated with higher levels of children's PA (Nielsen et al, 2010; Nielsen et al, 2012; Taylor et al, 2011; Van Kann et al, 2016). Ridgers et al (2010b) also found that introducing playground markings and fixed equipment to the playground did result in an increase in children's PA in the short term although after one year, it had tailed off suggesting perhaps that providing new fixed play equipment alone might not be an economically viable option for encouraging children to be more active over a longer period of time.

A variety of equipment and more of it has been reported to generate a sense of fun in the playground and to encourage active play (Caro et al, 2016) and it seemed to be the case, too, in the present study that children perceived spaces without features to be boring and dull and that they were more fulfilled and less bored when equipment was available. The design of the equipment was also thought to be important, with some children commenting on how its colour, materials or size might affect them. These are elements that have also been found to count in other qualitative research (Caro et al, 2016; Willenberg et al, 2010) and suggest that children are motivated to engage with equipment by a variety of factors.

In order to appeal to children's individual tastes and preferences, it seemed that having a variety of play opportunities was important for encouraging more children to be active in the outdoor environment and this idea of diversity is encompassed in theme 6 (variety of provision facilitates PA). Adults and children thought that having a variety of spaces in the school grounds was conducive to children being active and the importance of providing a range of spaces, catering for individual tastes and moods has also been highlighted before as being important for encouraging different types of play, including active play (Tranter and Malone, 2004; Moore, 1986) and reported by girls to be important for their active play at break time (Pawlowski et al, 2019b; Snow et al, 2019). Most participants talked about areas for ball games and sports and children, in particular, mentioned places that were personally significant such as '*the bottom path'* and the '*Jubilee gardens.'* Similar responses have been reported previously where children have described specific spaces such as areas between buildings used for hide-and-seek or zones for structured sport and running as providing possibilities for being active (Eskola et al, 2018). Grassy and natural areas such as woodland and wild areas in particular were viewed in the present study as spaces which might encourage children to be active and have been reported before as important settings for PA, especially for girls (Coen et al, 2019; Pawlowski et al, 2019b).

Play spaces are likely to be perceived differently according to personal factors and accessed in different ways. Pawlowski et al (2019a) found, for example, that after a playground was altered to provide a wider selection of spaces, girls thought that there were more opportunities to be active, whereas boys reported that as they had played soccer before and after the alterations, their PA behaviours had not changed with the new playground. In the current study, there were different responses to the removal of some monkey bars which created a new type of space, with one girl describing the new space as '*now… it's really fun*' (Mel) and another as '*now…it's kind of boring'* (Chelsea).

It was thought, also, that children of different ages needed equipment to suit their developmental stage as well as opportunities to use equipment in different ways according to their age and interests. Caro et al (2016) reported how children in their study were emphatic that tailored equipment needed to be available so that younger and older children could all enjoy the playground and interventions have shown that the provision of equipment can influence children's PA in different ways at different ages (Lopes et al, 2009; Ridgers et al, 2007a; Stratton and Mullan, 2005). In the current study, some participants viewed certain equipment as being more suitable for younger children and thought that as children reached the later years of primary school, they needed to present an image which prevented them from using some items. Through collaboration, perhaps, it could be possible to determine what equipment would feel more acceptable to older children and to provide new items accordingly.

The idea of having quiet spaces in the playground such as a library or simply for 'chilling out' was spoken about by participants in this study. Secluded areas for sitting and socialising have been reported as important by some girls in previous qualitative work (Pawlowski et al, 2014; Pawlowski et al, 2019b) and a number of areas in playgrounds have been observed to be places where children congregate to engage in sedentary behaviours (Dyment et al, 2009). Dyment et al (2009) discussed the point that playtimes serve a number of functions aside from children being active and that girls in their study made it their choice to engage in quiet, creative or social behaviours which did not require a high level of PA. Even in this case, engaging in LPA could potentially confer some health benefits when replacing sedentary behaviours (Poitras et al, 2016). Furthermore, it is likely that there are other health benefits associated with calm, relaxing play activities which would be missed in a culture which only advocated active play (Alexander et al, 2015).

Having the opportunity to choose alternative, low-level activities may be an important aspect of play and development for some children. Given the recent UK government plans to tackle childhood obesity (DHSC, 2016) requiring primary schools to deliver 30 minutes of MVPA for pupils every day, assessment of which is to be taken into consideration by Ofsted during school inspections, schools will face the challenge of how to balance children's need for unstructured leisure times against the necessity of taking time in the school day for periods of PA for all pupils. While playtimes may seem to be opportune for introducing compulsory physical activity as academic learning slots would not be affected, the need and desire for children to play in self-chosen spaces in their own individual ways seem to be essential points to consider when making policy decisions which address these new requirements.

Ideas concerning outdoor education as being facilitative of children's PA formed the content of the seventh theme (physical activity is encouraged through opportunities for outdoor learning). Schools rated learning in the outdoor environment as important for the Early

Years and Foundation stage children in their care which is not surprising considering the emphasis on outdoor learning for young children in UK curriculum guidelines *(Department for Education, 2017).* Outdoor learning experiences were thought to decline, however, as children moved through the school. This drop in provision has been recorded previously (Waite, 2010) and is thought, perhaps, to be as a result of core curriculum pressures (Marchant et al, 2019; Waite, 2010) and an under-valuing of play and informal learning possibilities. Van Dijk-Wesselius et al (2020) also identified physical constraints, unfamiliarity with outdoor learning in the curriculum, difficulty in getting started and a lack of teacher confidence as being inhibitors.

For older children, physical activity that accompanies outdoor learning could be an invaluable component of their recommended daily target for MVPA. There is some evidence that children are more active when learning in an outdoor environment (Munoz, 2009), especially in green, natural spaces. All four schools in this study were incorporating some outdoor learning elements into their curriculum and extra-curricular pursuits through activities such as creating or maintaining ponds, forest school sessions, school gardens and identifying plants and animals in the school grounds. However, outdoor learning sessions were not always regular or planned and weather and safety concerns were barriers to them being implemented. Some adults in the current study were also cautious about the value of outdoor education and concerned about practical aspects of its implementation. Children, on the other hand enjoyed the freedom afforded by outdoor work as has also been shown in other findings (Marchant et al, 2019). Training for teachers may be an important aspect in developing outdoor learning (O'Brien et al, 2011; Pether, 2012) especially if it involves a component of practical experience which could help practitioners to think outside of the box (Waite, 2010). In this study, for the adults who mentioned training, it seemed to have raised a number of questions which were still unresolved relating to the underlying benefits for children of providing lessons outside and how they could be practically achieved.

PE was the most frequently mentioned lesson by adults and children that took place outside and several children commented about their enjoyment of this in a larger space and in the fresh air. One school was also actively developing cross-curricular links with PE, with a view to being able to engage in those integrated activities outside. A survey of English schools

(Prince, 2019) showed that 13% of the responding schools reported using the outdoor environment for literacy and numeracy activities. Linking core subject teaching with physical activity is a strategy that has shown some success in raising children's PA levels during the school day whilst still maintaining teaching time for subjects which are tightly monitored and assessed (Erwin et al, 2011; Greene and Dotterweich, 2013; Martin and Murtagh, 2015). Where classrooms are too small for children to move about in, the outdoor environment could offer an alternative venue for active lessons.

Football came across as an important game for break times in interviews with adults and children and is the subject of the eighth theme (football is for boys). The game was perceived strongly as being for boys and there was a definite sense that boys felt as if they were in charge and could decide who the players could be. Pawlowski et al, (2014) reported that girls were only accepted by boys as players if they could demonstrate adequate skill levels and this was corroborated in the current study and in other work (Martínez-Andrés et al, 2017). Football has been found before to be dominated by boys (Pawlowski et al, 2016) and, due to the space needed to play it, this means that peripheral space, around the edges of the marked pitch, is sometimes all that is left for girls and boys who do not wish to join in (Knowles et al, 2013; Martínez-Andrés et al, 2017). This was a phenomenon reported too by participants in the present study.

It was observed that girls spent time watching football, playing on equipment, walking round and chatting or engaging in a variety of gymnastics or chase activities in the space left to them. Stellino and Sinclair (2014) found that girls engaged in similar types of activities while the majority of boys in their study played football. These activities might be active choices. Powell et al (2016), for example, reported that girls expressed a preference for walking around in small groups with boys stating their liking for large group games. It could equally be that children who are not accepted on the football pitch or do not want to play football, do not have sufficient space left to engage in competitive team-based sport of their own choice. At one school, where football was periodically banned, girls and boys played basketball together as an alternative when football was off the menu and tag rugby was also perceived to be a game that was suitable for girls and boys, although not necessarily easy to play with football dominating the playground. The content analysis also revealed that basketball and running games were of interest to girls and boys, with at least an equal proportion of girls mentioning these games.

A final theme brought together the ideas about actions that schools might take to address some of the problems identified by participants in this study (school actions can support children's PA in the outdoor environment). These included rota systems, staggered breaks, partitioning spaces, providing equipment and alternative play surfaces. Making adequate room available for football whilst enabling other games and activities to take place simultaneously and comfortably elsewhere is likely to be important when considering how to facilitate active break times for all children. In the current study, two schools used rota systems which allocated pitch time to specific year groups at different times as a means of addressing the limitations of space and conflicts associated with football on the playground and dividing space into zones for a range of different activities was a further strategy used to allow football to co-exist with other activities in the school grounds. Cost was mentioned as a potential barrier for making substantial changes in the playground to improve safety through solutions such as laying down multi-weather surfaces to prevent slipping in bad weather and partitioning space to separate football by means of barriers. Rota systems and staggered playtimes were being used, too as a means to achieve less crowding. Where these strategies have been used previously, effectively increasing play area per child, children have been more active at playtime (Loucaides et al, 2009, D'Haese et al, 2013) indicating that these simple, low cost approaches could have some benefit for encouraging greater levels of PA in the playground.

A number of practical, financial and policy issues sometimes prevented children from accessing the equipment they desired although children were able to articulate clearly what is was that they would like to be available. Caro et al (2016), in their participatory research with children, found that children had expert knowledge of the playground and were able to make informed and considered suggestions about what goes on in that space. They concluded that children need to be involved in decisions to do with their play environments. Simple changes could be made on the basis of children's comments in this study that would require very little budget and minimal adult input with the possibility of encouraging more children to be more active.

In addition, Cycle storage was a feature thought by adults and children to be one that could be introduced into or enhanced by schools as a measure to encourage more children to cycle to school and for some children this was an important factor as they were concerned that their bikes could be stolen from the school grounds. Secure cycle parking has been considered to be crucial for encouraging children to cycle to school (Sustrans, 2010) yet, fearful of health-and-safety consequences or limited for space, some schools do not allow children to keep bikes in their grounds during the school day (Cycling UK, 2017). In the current study, one child spoke of their school banning bikes and building work at two schools had also, temporarily, closed access to bike storage areas. Everett Jones and Sliwa (2014) found that having bicycle racks was one low-cost strategy that schools could provide which was associated with a larger percentage of students walking or cycling to school, although only 62.4% of schools provided them.

The results of the content analysis also showed that the schools in this study were implementing a range of International (Walk/Bike to school days), National (Bikeability, Junior Road Safety Officers) and local (eg allows heelies; bike and scooter day, rewards) initiatives to promote active travel. Interestingly, it was only children who mentioned specific health and environmental aspects of their curricular study which they thought might be important with regard to walking or cycling to school. In the view of 'Cycling UK' (2017), it is important that the whole school community *'actively recognise(s) the health, social, environmental and educational benefits of encouraging students and staff to cycle.'* Primary school pupils are often enthusiastic about engaging in learning about sustainability (Gayford, 2009) and naturally interested in the environment (Natural History Museum, 2015) so incorporating work about active travel into the curriculum is likely to be a useful starting point for encouraging an active travel ethos in the school.

4.5.1 STRENGTHS AND LIMITATIONS

One strength of this study is that the researcher, KW, conducting the interviews is an experienced teacher, familiar with school settings, personnel and with ways of engaging children in a variety of situations. Feeling comfortable in the school environment and having many common points of interest with school staff and confidence with working with children enabled relationships to be established quickly with participants and eased the organisation of the project and practical arrangements on the days of the interviews.

A further strength is that children were selected randomly from a representative sample, from which only 3 out of 92 children did not consent to participate (non-response rate: 3.3%). This ensured a balance of boys and girls and is likely to have contributed to diversity of experiences and interest in relation to PA. Introducing the picture task in the later part of the interviews with children also worked well to prompt further details, allow participants to corroborate and elaborate on earlier statements and to sustain focus in what was, for some, an unusual and un-nerving situation. Children eagerly responded to the task of selecting photos and several enjoyed helping to set them out and the chance to move around which, for some, may have helped to facilitate a positive and enjoyable experience.

There are also several limitations. Firstly it is possible that head-teachers or other staff at the four schools which responded were particularly interested in PA and/or outdoor environmental considerations to do with their school for one reason or another. There could be other schools which did not respond where staff and children have alternative and additional views. Perspectives about the school outdoor environment may not be the same in different school populations and so, as with all qualitative research, the results of this study are not generalisable to other school settings. This being said, a number of themes common to adults and children were identified across the four schools and could, potentially, have relevance in other settings.

A second limitation is the self-selection of adults which could mean that only the view-points of more motivated adults have been represented in this study and may not be representative of the views of the wider school communities. Also, only 17 out of the target sample of 20 adults were recruited to the study although as no new themes were coming up by the 17th interview, it is likely that data saturation had been reached and that the sample was large enough. In addition, ideas from younger children were not collected and interviews with adults were predominantly with non-teaching staff and only one head-teacher, although views from other staff were represented within the study.

4.6 CONCLUSIONS

In this study, the aim was to explore views from diverse members of school communities in order to acquire a broad picture of what adults and children believed to be important school factors for encouraging children to be active in the outdoor environment or that act as barriers to PA. A content analysis threw light on the types of equipment that schools offered and active transport initiatives, games and activities they supported which were thought to facilitate children's PA. Nine themes were also evident in responses from adults and children which reflected physical, social and policy aspects of school provision for PA in the outdoor environment. In the physical domain, availability and sufficiency of space were identified as being important for facilitating children's active play. Availability and variety, too, of different play spaces, including grassy and green areas and a selection of loose and fixed equipment were thought to motivate children to be active. Social factors including the active encouragement of peers and adults and the presence of trained children enacting roles of responsibility during break times were seen to be important facilitators of children's PA whilst negative peer interactions, cultural expectations and adult presence were viewed as potential barriers. Both the possibility of injury and harm as well as the need for risk and excitement were recognised as being factors which might have some bearing on how children's active behaviours are managed in the playground. Cost, feasibility and management decisions were sometimes barriers to schools for making changes which could enhance the playground experience for more children so that the potential for PA promotion could be maximised.

CHAPTER 5

QUALITY OF SCHOOL OUTDOOR ENVIRONMENT SURVEY (QSOE)

5.1 INTRODUCTION

In Chapter 4, multiple school factors reflecting physical, social and policy domains as conceptualised within a socio-ecological model (Sallis, 1988) were suggested by adults and children as being important for encouraging children to be active in the outdoor environment. These included, in the physical domain, factors such as the presence of fixed and loose equipment for games and activities, the size and types of space available and the provision of cycle storage. Some of the social factors were the involvement of peers as friends and in positions of responsibility and of adults for monitoring play spaces, facilitating games and direct encouragement. Policies for outdoor education, use of space, provision and availability of equipment were also thought to be facilitative of children's PA. This first-hand information, from school community members of UK primary schools was then used to inform the development of a school survey, the Quality of School Outdoor Environment survey (QSOE) which was specifically relevant to primary schools.

By supplementing concepts gleaned from the literature review in Chapter 2 with the results from the qualitative interviews with adults and children in Chapter 4, it was thought that a more comprehensive set of items describing school outdoor environmental provision for PA could be identified. This step, of including a qualitative stage for item generation to ensure that diverse views are represented in the creation of a survey instrument, is suggested as being an important stage when creating new tools (Morgado et al, 2018; Ricci et al, 2018) and in the current study, allowed children's unique viewpoints to be included in QSOE response options.

The development of this survey and its subsequent distribution are described in the current chapter. In this chapter, too, the rationale is set out for the need to design a new survey. Limitations of other survey instruments that have been developed elsewhere (See Section 5.2) and used previously to assess schools' outdoor PA environments are discussed. Future directions for survey development (See Section 5.5.6) are considered including ways in which the QSOE could be assessed for validity and reliability.

5.2 BACKGROUND

As a measure to combat the rising trend of mortality from non-communicable diseases and to address the associated behavioural risks including physical inactivity, WHO guidance has called on schools to develop policies and programmes to promote PA in the school setting through behavioural, educational and environmental changes (WHO, 2004). The global strategy recommended that schools '*should be equipped with appropriate facilities and equipment*' (WHO, 2004, Page 9, Paragraph 43). A follow-on plan (WHO, 2013) reiterated the involvement of educational settings and proposed that they include '*opportunities for physical activity before, during and after the formal school day*' (WHO, 2013, Page 33) and that there should be '*creation and preservation of built and natural environments which support physical activity in schools…with a particular focus on providing infrastructure to support active transport, active recreation and play*' (WHO, 2013, Page 34). At the same time, the WHO advocated the use of evidence-based strategies and practices for prevention and control of non-communicable diseases (WHO, 2013, P13). It is clearly important, therefore, to be able to identify which specific aspects of the school environment might encourage active behaviours so that schools can make informed investments and policies.

The development of valid and high quality measures is necessary so that components of the environment can be evaluated in relation to children's PA (McKinnon et al, 2009). Numerous tools have been developed for assessing features of the PA environment (Carlson et al, 2017), ranging between systematic observational instruments, self-report and Geographic Information System (GIS) methodologies (McKinnon et al, 2009) and in the school setting, research tools in the form of audits, quesionnaires, inventories and surveys have been used previously to assess schools' outdoor PA environments (Section 1.5.2).

Systematic audit tools, whilst allowing for reliable and objective evaluations of the school outdoor environment to be made, have focused predominantly on aspects of the school's physical landscape including physical features relating to ATS (e.g. Broyles et al, 2015; Jones et al, 2010), enabling an assessment of school grounds to be made on the basis of walking provision, cycling provision, facilities, aesthetics and design or as an overall, 'score' based on all the components combined. Additionally, some observational methods, such as SOPLAY (McKenzie, 2006) which have been developed to assess PA concurrently with aspects of the school physical environment have also incorporated a small number of social elements although SOPLAY, as a measure of school grounds environment characteristics only reflects a limited part of what is available (Sallis, 2009); in the case of SOPLAY, the presence of equipment, organised activities and supervision. Audits of the physical environment have also been combined with additional items in the form of questionnaires to extend the reach of the research. Van Sluijs et al (2011), for example, combined the 44 item audit developed by Jones et al (2010), with additional policy-related questions.

Many questionnaire-based instruments used to appraise the quality of the school outdoor environment have also focused predominantly on physical and/or policy aspects of the school environment (Cardon et al, 2012; Hardy et al, 2010; Hardy et al, 2016; Haug et al, 2010; Lounsbery et al, 2013; McKendrick, 2005), sometimes including aspects of active transport (Ward et al, 2015;) or a focus solely on the school playground (Chancellor, 2013; Nielsen et al, 2012) or break times (Baines and Blatchford, 2019; Blatchford and Baines, 2006). Some tools have been designed to investigate only a small number of variables relating to the outdoor environment such as the area of play space and presence/absence of playing facilities (Gomes et al, 2014), the number of permanent play facilities and/or playground area (Haug et al, 2010; Nielsen et al, 2012) or incorporated a main focus also on PE (Gomes et al, 2014). A small number of instruments have included questions regarding the school's social environment. For example, Nathan et al (2013) sought to find out whether teachers joined in with children's games during break times and Baines and Blatchford (2019) examined the level and type of supervision, provision of organised activities and pupil perceptions of social opportunities and behaviour at break-time as part of their study. A measure is therefore needed that reflects the broader dimensions of the school outdoor environment as viewed within a whole of school ecological approach.

In addition, surveys designed to be specific to school environments in one country may not be generalizable to other places due to differences in national and district policies, culture and terrain. Therefore, for accurate assessment of school environmental provision in any particular region, it is important to use measures designed specifically to suit the environment that is being studied (Giles-Corti et al, 2005). Few measures have been designed specifically for use in the UK and only an audit of the physical environment has been shown to have good predictive validity, being able to differentiate children's MVPA levels between schools demonstrating 'high' and 'low' environmental scores (Jones et al, 2010).

Children's views have only sometimes been incorporated into the development of survey instruments (eg. Baines and Blatchford, 2019). In some cases existing instruments have been adapted for different purposes (Broyles et al, 2015; De Meester et al, 2014; Harrison et al, 2016; Haug et al, 2010; Jones et al, 2010; Lounsbery et al, 2013; Taylor et al, 2017; Ward et al, 2015) or may be derived from hypothesized associations (Van Sluijs et al, 2011) or from previous research results in the literature (Cardon et al, 2012; De Meester et al, 2014; Lounsbery et al, 2013; McKendrick, 2005; Nathan et al, 2013; Nielsen et al, 2010; Van Sluijs et al, 2011). Development has sometimes been with the advice of an expert panel (Cardon et al, 2012; Lounsbery et al, 2013; Massey et al, 2018b; Nathan et al, 2013) and in some cases the process of designing the survey or questions is not described (Chancellor, 2013; Hardy et al, 2010) other than by being 'constructed by the authors' (Gomes et al, 2014) or having components *'assumed to be relevant for physical activity'* (Haug et al, 2010).

The main aim of the current study, therefore, was to take the first steps towards developing a comprehensive survey instrument, the Quality of School Outdoor Environment Survey (QSOE) for assessing quality of school outdoor environmental provision for PA that incorporated social as well as physical and policy elements of provision, included outdoor learning elements and items to evaluate schools' provision for active transport. The intention was to create a low cost, low burden online survey, incorporating children's and adults' ideas about school promotion of PA in the outdoor environment, expressed through individual interviews (See Chapter 4) into the instrument design thus making the survey instrument highly relevant to the study population.

Pre-testing/piloting surveys is considered to be important for identifying problems to do with question design and feasibility of data collection procedures (Ruel et al, 2016) and this was a further objective of this study. Specific questions related to this stage were:

- Is the QSOE a useful tool for collecting information about physical, social and policy elements of primary school provision for PA in the outdoor environment?
- Do elements of question design affect responses? *items being missed, 'other' and 'open' answers*, *little/no response variation*, *sensitive questions (based on Ruel et al, 2016) subjectivity*.
- How successful is an online recruitment and distribution strategy for the QSOE survey in primary schools?

A final objective was to use the survey to describe the provision that this sample of English schools currently makes for children to be active in the outdoor environment in order to identify the range of facilities and practices on offer to children at those schools.

5.3 METHODS

A cross-sectional online survey design was used to collect information from schools in England about factors to do with their provision for PA in the outdoor environment which might influence children's physical activity.

5.3.1 SURVEY DESIGN

The QSOE was developed to capture information about physical, policy and social environmental characteristics of primary schools which may be associated with children's physical activity in the outdoor environment. Survey items were designed with reference to views and perceptions of adults and children who work in schools using the interview data collected in Chapter 4 together with pertinent information from published literature. Response options included yes/no choices, Likert-style options and, in order to include the numerous ideas put forward by members of the school communities, several multiple choice questions were included so that types of spaces, fixed and loose equipment, playground markings, games, activities, after-school opportunities, adults' break-time roles and active transport initiatives thought to be important could be presented clearly as options. An initial draft of the QSOE was tested for face validity by three academic experts after which some items were condensed and minor changes made to wording. One item, 'amount of outdoor space' was initially designed as a multiple choice question and changed to allow scaled responses as shown in Table 5.1.

Please indicate which word/phrase best describes the amount of outdoor space with relation to the number of children at your school. Please select only one word/phrase		**Please indicate to what extent the following statements describe the amount of outdoor space you have at your school with relation to the number of children.**
cramped		school space is crowded (1-5)
crowded		school space is extensive (1-5)
small		children have enough space to play (1-5)
tiny		
too small		
average		
sufficient		
ample		
plenty of space		
big		
extensive		

Table 5.1 Amount of space as multiple choice question and as 3 scaled questions

The survey was also completed at two different schools by one head teacher and one teaching assistant who suggested small amendments and additions such as adding a 'suburban' category for school location and the option of a 'traversing wall' as well as a 'climbing wall'. The final version consisted of 47 questions divided into 9 sections. A summary of the sections is shown in Table 5.2 and the complete survey can be seen in Appendix 4.

Section	Subject of Section
1	Details about the school
2	Spaces in the outdoor environment at school
3	Playground equipment
4	Games and activities
5	Before and after school activities
6	Outdoor learning opportunities
7	Active transport
8	Staff and children
9	Policies and practices

Table 5.2: Sections of the QSOE

5.3.2 QSOE IMPLEMENTATION

The survey was delivered using the 'Online Surveys' tool (Online Surveys 2021: formerly Bristol Online Surveys) which allowed for online distribution as well as for the possibility of making paper copies. It contained a variety of simple yes/no and multiple choice questions for ease of completion and space for elaboration. Any staff member with a good working knowledge of school activities and procedures relating to the outdoor environment could complete the survey in under20 minutes.

5.3.3 RECRUITMENT

Distribution of the survey took place in two ways. Firstly**,** from a total of 2989 state primary (Children aged 5-11) and junior (Children aged 7-11) schools in the Midlands region of England, schools were selected randomly on the basis of random number generation, from publicly available lists and invited to complete the online QSOE survey through a link in an email to head teachers. In the event of no response, a second email request was sent and some schools were also contacted by telephone resulting in a total of 2,468 schools being invited during the contact phase of the study. Detailed participant information was made available through an attachment to the invitation email and via a link on the first page of the survey. The chance to win £150 to spend on playground equipment was offered as thanks for participation.

To increase response rates, schools were also recruited by means of an invitation poster which was used to attract participants in a variety of ways. In particular, the poster was distributed by 6 school head teachers, known to KW, to the schools in their local networks. It was also displayed on social media by school teachers known to KW and who have further contacts in schools and distributed within school sports networks by two PE co-ordinators.

5.3.4 PARTICIPANTS/SCHOOL SAMPLE

At each school recruited to complete the survey, one head-teacher or nominated member of staff who had a good working knowledge of the school was invited to complete the QSOE survey. The target sample size for the survey was 100 schools which is within the range of 30-100 suggested by Ruel et al (2016 P.114) as a 'general rule of thumb' for pilot testing.

5.3.5 ETHICS

Participant information was provided as an attachment to the invitation email and was also available on the first page of the survey. Completion of the survey was considered to be consent. The study was given ethical approval by the Faculty of Medicine and Health Sciences Research Ethics Committee at the University of Nottingham (Ref: D200317; Appendix 2)

5.3.6 DATA ANALYSIS

Schools were described in terms of their numbers on roll, (Q.3) location, (QSOE Q.2 and Q.4) presence of KS1 and KS2 classes (QSOE Q. 33 and Q.33b) and pupil premium percentage (as classified by the most recent Ofsted report for the school); pupil premium being funding for schools to support disadvantaged pupils with their education (Education and Skills funding agency, 2020). Respondents were described in terms of their roles within the schools (QSOE Q.5). A descriptive analysis of the survey was undertaken to provide a record of the range of facilities and policies underpinning PA provision for children in the participating schools with the content analysis categories and themes identified in Chapter 4 providing a guide for the analysis. Table 5.3 shows how information from specific survey questions informed each descriptive category.

Sum scores were created for multiple choice items. Where additional types (e.g. of equipment, spaces, activities) were provided in the space allocated for 'other' responses, these were added to the lists of types available for each school. Results from open-ended questions and responses to 'other' questions which extended beyond simple listing of types, were collated and, through a process of deductive content analysis, (Braun and Clarke, 2006) were coded according to the categories and themes shown in Table 5.3 Overall, 158 responses were coded, based on 10 questions. The number of responses provided by specific questions is shown in Table 5.3 Quotes were identified which exemplified this information and included in the results. The inclusion of these open-ended responses was thought to expand on the closed questions by adding depth and context (Harland and Holey, 2011).

Cronbach's Alpha was used to test the internal consistency of subjectively rated questions relating to the size of the school grounds. These were questions which asked respondents to rate the extent to which they thought their school grounds were crowded, extensive and sufficient (QSOE Q. 6 parts 1-3). An objective estimate of the size of school grounds was also made using the 'Google Earth' area tool. For each school, an approximate area of the school grounds was calculated by drawing around the main playground and field features associated with each school on 'Google Earth.' Concurrent validity of the subjective area questions was assessed through Spearman rank correlations with the objective 'Google Earth' estimates.

The Mann-Whitney U test was used to compare participating schools on socio-economic measures, provision of equipment, numbers on roll and size of outdoor space (using Google Earth estimate) depending on their location. Schools were split into two location categories formed by schools that reported their location as 'rural' or 'urban/suburban.' To determine whether there were any differences between the schools that completed this survey and the full set of schools who were invited to participate in the survey, a random sample of the same number of non-participating schools was selected. To select these schools, numbers were generated randomly in order to select schools from a numbered list. Chi square tests were then undertaken to compare the pupil premium (high, average, low) and numbers on roll (high, average, low) as classified by Ofsted between these two sets of schools.

Category from Chapter 4 analysis	QSOE Question Topic	QSOE Question Number (Number of options/items)	'Other' free-text Information (Number of additional responses included in deductive thematic analysis)
Loose Equipment	Loose equipment types	Q.10 (26)	Q.10a. Additional Types added to summed score for each school that offered this information. (6)
	Loose equipment availability-different ages	Q.11 (5)	
	Loose equipment availability-different times of the day	Q.12 (6)	
	Loose equipment availability-different weather conditions	Q.12a (3)	
	Loose equipment availability-games	Q.18 (Yes/No)	Q.18a Limitations described if equipment unavailable (17)
Fixed Equipment/ Playground Markings	Fixed equipment types	Q.13 (14 items)	Q. 13a. Additional Types added to summed score for each school that offered this information. (1)
	Social furniture	Q.40 (3)	
	Fixed equipment availability-different times of school day	Q.14 (5)	
	Court/pitch markings Chalk available	Q.15 (6) Q.16 (3)	
Games and Activities	Types of games	Q.17 (14)	Q.17a. Additional Types of games played by all children listed. (3)
	Types of activities	Q.21 (17)	Q.21a Additional Types of activities for all children listed. (2)
	Daily Mile	Q.23 (Yes/No)	
Active Transport	Allows cycling to school	Q.35 (Yes/No)	
	Active transport provision	Q.36 (14)	Q.36a Other option (Only one given) used in descriptive text.
Space	School space is crowded School space is extensive Enough space to play	Q.6 (5-point scales)	
	How well is space utilised?	Q.7b (5-point scale)	
Safety	Are any games banned? Are any activities banned?	Q.19 (Yes/No) Q.22 (Yes/No)	Q.19a Additional types of games that are banned described in text. (34) Q.22a Additional types of activities that are banned described in text. (20)
	Is football allowed as weather conditions deteriorate?	Q.20 (Yes/No)	
Social Factors: Children	Types of responsibility taken by children	Q. 39 (5)	Q.39a Two options suggested by schools described in text.
	Training for roles of responsibility	Q.39a (Yes/No)	
	Has bullying been a problem?	Q. 43 (3)	

Social Factors: Adults	Roles of adults who facilitate PA during break times	Q.37 (5)	Q.37a 5 additional options suggested by schools described in text. (1)
	Adult facilitation of PA at playtime and lunch breaks	Q.38 (9)	Q.38a 2 additional options suggested by schools described in text.
Variety of Spaces	Types of spaces	Q.7 (17)	Q.7a Additional Types of spaces added to summed score for each school that offered this information.
	Field availability-different times of the year	Q.8 (4)	
	Woodland availability-different times of the day	Q.9 (6)	
	Woodland availability-different times of the year	Q.9a (4)	
	Playground availability-before and after school	Q.46 (Yes/No) Q.47 (Yes/No)	
Outdoor Education	Allocation of time for outdoor learning	Q.26 (5)	
	Training for outdoor learning	Q.27 (Yes/No)	
	Forest schools	Q.28 (Yes/No)	
	Garden	Q.29 (Yes/No)	
	Pond	Q.30 (Yes/No)	
	Covered areas	Q.31 (Yes/No)	
	Provision of clothing	Q.32 (Yes/No)	
	Allocation of time for KS1 and KS2 PE each week	Q.33a,b (time)	
	Policy exists for outdoor PE	Q.33c (Yes/No)	Q.33ci (9)
	What happens in bad weather?		Q.33d (65)
After School Activities	Types of after school activities provided	Q.25 (23)	Q.25a Additional types of After School Provision listed in conjunction with multiple choice responses
Additional Policies	Playground rules in place	Q.41 (Yes/No)	
	Playground rules displayed clearly	Q.42 (Yes/No)	
	School takes part in inter-school competitions	Q.44 (Yes/No)	
	Wet weather policy	Q.45 (7)	

Table 5.3: QSOE questions informing descriptive categories

At three schools, a sub-set of 33 QSOE questions was completed on-site by a researcher and percentage agreement between these researcher observed responses and school on-line responses to the survey was calculated. This particular sub-set of 33 questions comprised easily observable physical attributes of the playground that could be assessed during a 15 minute break time when the researcher was able to observe children in their outdoor environment.

5.4 RESULTS

Sixty-eight schools responded to the QSOE (<3% response rate). Of these, 62 were from the Midlands area of England. The remaining six consisted of 2 London Schools, 2 from Northumberland, one from Somerset and one from Southampton. The 68 schools ranged in size from 28 pupils on roll to 720 with a median of 261 pupils. All schools had Key Stage 2 classes (KS2; Children aged 7-11) and 87% had children in Key Stage 1 (KS1; Children aged 5-7). Table 5.4 shows the numbers of schools recruited based on their number on roll, location and pupil premium percentage.

	Number on Roll (As classified by Ofsted)			Location			Pupil Premium Percentage (As classified by Ofsted)		
	High	Average	Low	Urban	Suburban	Rural	High	Average	Low
Number of schools recruited	31	14	23	29	20	19	29	5	34

Table 5.4: Characteristics of recruited schools

Respondents had a variety of different roles within the schools which are shown in Figure 5.1.

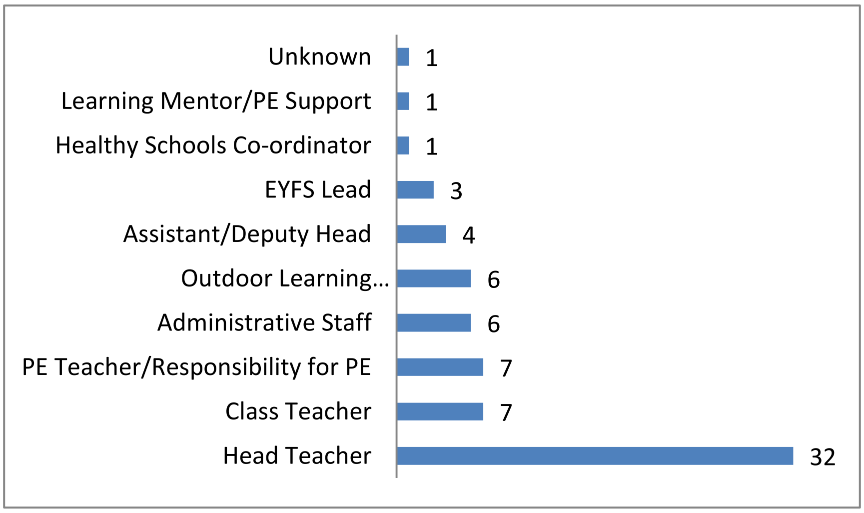


Figure 5.1: Roles of survey respondents

Urban/Suburban schools had higher numbers on roll, were situated in areas of higher deprivation and had larger school grounds than rural schools. There were no statistically significant differences in the provision of fixed or loose equipment between rural and urban/suburban schools (Table 5.5).

	Estimate of Size of Grounds (m^2)	**Number of pieces of Fixed Equipment**	**Number of pieces of Loose Equipment**	**Number of types of Space**	**Area Deprivation (Rank)**	**Pupil Premium (%)**	**Number on Roll**
Urban/ Suburban	7023	6	11	10	11759	24	326
Rural	3376	5	10	8	22781	12	132
p	**0.007**	0.371	0.944	0.064	**0.005**	0.095	**0.001**

Table 5.5: Comparisons between urban/suburban and rural schools.

No significant differences were found in pupil premium % between schools which did and did not participate in the survey, χ^2 (df 2, n=136) =4.375, p=0.112 or in numbers on roll, χ^2 (df 2, n=136) =5.745, p=0.057 (Tables 5.6 and 5.7).

	Low Pupil Premium %	**Average Pupil Premium %**	**High Pupil Premium %**	**Total**
Schools in Survey	34	5	29	68
Random Sample of Schools not in Survey	22	7	39	68
Total	56	12	68	136

Table 5.6: Frequency distribution of pupil premium % categories (high, medium, low) for schools in the survey and a random sample of schools not taking part in the survey

	Low Number on Roll	Average Number on Roll	High Number on Roll	Total
Schools in Survey	23	14	31	68
Random Sample of Schools not in Survey	32	5	31	68
Total	55	19	62	136

Table 5.7: Frequency distribution of number on roll categories (high, medium, low) for schools in the survey and a random sample of schools not taking part in the survey

Percentage agreement was found to be 83% between the researcher's record of facilities during visits to three schools and the school's own online responses to the same questions on the sub-set of 33 QSOE items relating to physical aspects of the school grounds.

5.4.1 EQUIPMENT/FACILITIES PROVIDED FOR CHILDREN IN THE OUTDOOR ENVIRONMENT

5.4.1.1 LOOSE EQUIPMENT

The 68 schools provided many different types of loose equipment for children to use when they were outside (Table 5.8). The number of types of equipment available at each school ranged from 1-23, with a median of 11 different types. Most commonly provided were skipping ropes (90% schools), footballs (87% schools), a selection of balls (79% schools), hula hoops (74% schools), basketballs (66% schools) and bean-bags (66% schools). Some schools made large outdoor games such as chess and draughts (12%) or large dice (25%) accessible to children whilst others provided a music system so that children could dance (24%) or large musical instruments (13%). In a number of schools, racquets (53% schools), bats (57% schools), ball scoops (43% schools) and hockey sticks (25% schools) were available. In 87% of the responding schools, loose equipment was available to all year groups with 47% schools making it available to the children at all playtimes and 49% schools stating that the equipment was available only at lunch break. Fifty-six percent of the schools had equipment available in rainy weather whilst in a further 37% children were not allowed to use the loose equipment when it rained.

Three quarters of participating schools reported moveable equipment to be freely available for the games that children wanted to play. Where equipment was not freely available, there were a number of different reasons given for this. Some schools made equipment available on a rota-basis to ensure access to all year groups so children could only use certain items at specific times. At others, classes were sometimes allocated one football each or equipment was varied over time to *'…ensure interests are met and space used as safely and effectively as possible (Respondent)….'* One school reported limiting equipment use to lunch breaks only due to time restrictions. Equipment availability was tied in with adult availability in some schools and with play leaders/sports ambassadors who organised activities. Factors to do with the school environment also limited equipment use. One school reported the equipment to be '… *all in a container on the playground that's really hard to open and children are not allowed inside-only the mid day supervisors…' (Respondent).* Lack of space, resources and funding further limited equipment accessibility as well as weather and ground conditions. Equipment use was sometimes limited when it was being used inappropriately or too much was being broken by the children.

Loose Equipment	Schools Reporting Item/s (n)	% Total
Skipping ropes	61	90
football/s	59	87
selection of balls	54	79
hula hoops	50	74
basketball/s	45	66
bean bags	45	66
tennis ball/s	40	59
bats	39	57
racquets	36	53
cones	33	49
ball scoops	29	43
building bricks	24	35
french skipping	23	34
stilts	21	31
team/group bibs	21	31
litter pickers	19	28
parachute	18	26
hockey sticks	17	25
large dice	17	25
tags for games	17	25
ribbons	16	24
music player (for dance)	16	24
frisbees	14	21
foam javelins	13	19
music equipment	9	13
Other:(badminton equipment, skate trolley, catcha cup, rugby balls, chalks, swords, shields, building/construction equipment, large chess/draughts/connect four, jenga, conkers, crazy catch, tins to knock down, table tennis, space hoppers, bikes, balance boards, scoot carts)	8	12
digging equipment	6	9

Table 5.8: Loose equipment available in participating schools

5.4.1.2 FIXED EQUIPMENT

The number of types of fixed equipment available at each school ranged from 1-14, with a median of 6 different types. As shown in Table 5.9, 93% schools provided seats or benches in the playground and 84% had storage for children's cycles or scooters during the school day. Basketball hoops were provided by 78% of participating schools and football goals by 66%. Nearly three quarters of the schools (72%) had flower planters and 69% had a trim trail. Climbing equipment of various types was reported in some schools with 46% schools having climbing frames, 40% having a climbing/traversing wall and 25% having monkey bars.

Fixed Equipment	Number of Schools Reporting Item/s	% Total
seats/benches	63	93
cycle/Scooter storage	57	84
basketball hoop/s	53	78
flower planters	49	72
trim trail	47	69
football goals	45	66
friendship bench	37	54
shelters	33	49
climbing frame/s	31	46
climbing wall/traversing wall	27	40
monkey bars	17	25
buddy bus-stop	15	22
slide/s	10	15
arches	8	12
tunnel/s	5	7
swing/s	3	4
see-saw	3	4
car tyre park	3	4
peace-maker station	2	3
outdoor gym/fitness equipment	2	3
pirate ship	1	1
magnetic wall board games	1	1
shooting posts for balls	1	1
teepee	1	1
play houses	1	1
stage	1	1
sunken balancing equipment	1	1

Table 5.9: Fixed equipment available in participating schools

There were friendship benches in over half of the schools (54%) and buddy bus-stops in just over one fifth (22%) of the playgrounds. Very few of the schools reported the presence of swings (4%) or see-saws (4%) in their outdoor environment and only 15% had slides. Fixed equipment was not always available for children to use. Whilst 67% of 55 schools that responded stated that children could use the equipment in the 15 minutes before school, only 41% schools allowed children to use the equipment after school. Nearly all schools allowed access to the fixed equipment at break time and lunch time and half of the schools let the children use the equipment in all weather conditions.

5.4.1.3 PLAYGROUND MARKINGS

A large percentage of participating schools reported the presence of a variety of painted markings in their outdoor spaces (81%), with 91% having court or pitch markings on their hard surface areas and 84% specifically noting hopscotch markings. Fewer schools reported field markings (57%) or running tracks (56%). At 88% schools, chalk was provided for children to create their own playground markings at least some of the time.

5.4.2 POPULAR GAMES IN THE PLAYGROUND AT BREAK TIMES

For both girls and boys, football and chasing games such as tag/tig/dob/ were the ones reported as being most popular at playtimes and during the lunch break (Table 5.10). In nearly all (97%) of participating schools, boys played football at break times whereas girls played football during break times at 75% of the schools. Basketball was played by boys in 71% and by girls in 56% schools in the study. In some schools, dodge ball (32% girls, 38% boys) and tennis (34% girls, 32% boys) were popular games for both girls and boys. Cricket was reported as being popular for boys in 31% of responding schools and netball for girls in 31% of the schools. A variety of other games were also added in the ‘other’ section as being popular. These are shown in Table 5.11.

Popular Games at Playtime	Number of Schools that reported Girls Playing	% Total	Number of Schools that reported Boys Playing	% Total
football	51	75	66	97
chasing games	58	85	61	90
basketball	38	56	48	71
dodge ball	22	32	26	38
tennis	23	34	22	32
cricket	13	19	21	31
bulldog	16	24	21	31
cat and mouse	20	29	18	26
netball	21	31	16	24
hockey	12	18	12	18
rounders	13	19	10	15
tag rugby	5	7	8	12
rugby	4	6	8	12
badminton	8	12	6	9

Table 5.10: Popular games played at break-times in participating schools

Additional Games which are Popular in School Playgrounds	Number of Schools reporting Games	% Total
skipping games/ group skipping	10	15
role play such as Batman/Power Rangers/Star Wars/	5	7
traditional playground games: What's the time Mr wolf? Duck duck goose, Swim fishy swim	4	6
imaginary games such as feeding unicorns	3	4
parachute games	2	3
4 square/9 square	2	3
champ	1	1
table tennis	1	1
pebble hunts	1	1
games which change with what is in fashion/trending.	1	1
clapping games	1	1
children in the middle ball games	1	1
mini lacrosse	1	1
hide and seek	1	1

Table 5.11: Popular Games played at break-times in participating schools-Other

5.4.3 POPULAR ACTIVITIES IN THE PLAYGROUND AT BREAK TIMES

Tables 5.12 and 5.13 show the activities which were popular in participating schools at break times. For boys, the most common activities were general running around (97% schools), catching and throwing (81% schools), racing (76% schools) and making up games (71% schools). Walking around chatting (57% schools) and hide and seek (51% schools) were also popular amongst boys. General running around was equally popular with girls (97%) with walking around chatting also being a popular activity in 88% responding schools.

Making up games (87% schools), cartwheels (72% schools), handstands (72% schools) and gymnastics in general (56% schools) were also reported to be popular activities for girls as well as racing (62% schools) and hide and seek (51% schools). Interestingly, only 19% schools reported that boys liked doing cartwheels and 18% that boys liked doing handstands at break times with only 10% of schools reporting gymnastics as a popular activity for boys. While 66% schools marked dancing out to be popular amongst girls, far fewer schools (15%) thought that dancing was popular in boys. Cheerleading was also noted to be far more popular in girls (31% schools) compared to boys (4% schools). Sitting and chatting seemed to be fairly popular in both girls and boys although more schools (94%) indicated that this was more popular amongst girls than amongst boys (59% schools).

Popular Activities at Playtime	**Number of Schools Reporting Activities (Girls)**	**% Total**	**Number of Schools Reporting Activities (Boys)**	**% Total**
general running around	66	97	66	97
catching and throwing	45	66	55	81
racing	42	62	52	76
making up games	59	87	48	71
sitting and chatting	64	94	40	59
walking around chatting	60	88	39	57
hide and seek	35	51	35	51
athletics	31	46	31	46
jumping off equipment	22	32	30	44
jumping	24	35	23	34
relays	14	21	15	22
cartwheels	49	72	13	19
handstands	49	72	12	18
climbing trees	9	13	11	16
dancing	45	66	10	15
gymnastics	38	56	7	10
cheerleading	21	31	3	4

Table 5.12: Popular activities reported by participating schools

Twenty-five percent of the responding schools participated in ‘The Daily Mile, an activity run during school time each day for 15 minutes during which children run or jog a mile at their own pace with their classmates (The Daily Mile, n.d)

Additional Activities which are Popular in School Playgrounds	Number of Schools reporting Activities	%Total
playing with toy cars and lego	1	1
making dens	1	1
riding tricycles	1	1
table tennis	1	1
skipping	1	1
dancing	2	3
ball games	1	1
music with Equipment	1	1
bottle flipping	1	1
top trumps/swapping cards	2	3
reading/colouring/sketching/comics	5	7
playing with toys from home such as dolls	1	1
mile track	1	1
challenges on play equipment	1	1
sand-pit	1	1
dressing up	1	1
football aiming games	1	1
lego	1	1
singing	1	1

Table 5.13: Additional popular activities reported by participating schools

5.4.4 ACTIVE TRANSPORT

Active transport to and from school was supported in a number of ways by the schools in this study. In the first instance, the majority of schools (94%) allowed children to cycle to school and 60% allowed children to use scooters for their journey to and from school. A large proportion of the schools (84%) also provided storage for cycles although only 16% of the schools provided storage for cycle helmets. Training for children was provided by 82% schools about how to keep safe on the road through the National ‘bikeability’ training scheme (Department for Transport, 2021) and many schools (68%) offered road safety training to their pupils. Through the curriculum, some schools provided health messages (66%) and environmental information (57%) which might encourage children to seek active ways to travel. In smaller proportions, schools implemented further strategies. A ‘walk to school day/week’ was supported by half of the schools and a walking school bus used by 9%. Some schools had reward systems in place for children travelling actively to school (19%) and others chose children to be Junior Road Safety Officers (12%). About one fifth of schools implemented a travel plan. Natural constraints and safety concerns acted as barriers to school efforts to increase active transport in its pupils as described by one participating school:

'We are a rural school, so almost all children come in cars from a distance. We encourage all forms of walking/riding to school where it is safe to do so, but most children are unable to. They all walk down from the pub car park.'

5.4.5 SPACE IN THE SCHOOL OUTDOOR ENVIRONMENT

A large proportion (81%) respondents agreed/strongly agreed that their schools had sufficient space for children to play. In addition, only 23% of those who completed the survey thought that their school spaces were crowded and a majority of respondents (62%) estimated that their school spaces were extensive. Seventy-two percent thought that their school space was either fully or well utilised.

A reliability analysis was carried out on the questions which required respondents to rate subjectively the size of their school grounds (3 questions). Cronbach's alpha, $\alpha = 0.845$, showed the questions to have acceptable reliability for a research tool (Streiner, 2003). The subjective ratings were found to be weakly and significantly related to the objective estimates made by Google Earth (Table 5.14).

		Space measured by Google Earth
Space is Crowded	Correlation Coefficient	-0.362
	P	**0.003**
	n	66
Space is Extensive	Correlation Coefficient	0.334
	P	**0.005**
	n	68
Children have Enough Space	Correlation Coefficient	0.244
	P	**0.045**
	n	68

Table 5.14: Associations between subjective and objective measures of outdoor spaces

5.4.6 ASPECTS OF SAFETY

Some safety issues were reported in the survey through free text answers to questions asking about limitations to games and activities. Over three quarters of the schools banned certain games from taking place on the playground either permanently or periodically. The predominant reasons for this were given as being a lack of space or concern for injury.

Nearly half (46%) schools named 'Bulldog' as one of the games that was banned. Reasons for its exclusion included the numbers of children involved, insufficient space, that it caused or was perceived to cause too many injuries/accidents/collisions and the danger it presented to younger children and bystanders. In addition, respondents thought that it could lead to aggression, formation of gangs and arguments/fights. One school reported that boys took the game too far. At another, when bulldog became '*too physical.... [there was] a fixed term ban' (Respondent)*. It was reported to be difficult to designate specific areas devoted to bulldog so that when it was played in communal areas, children who were not playing the game were easily pushed and knocked into.

Football was banned occasionally by some schools (16%) mainly for behaviour incidents, arguments and disagreements which got out of hand. As well, it was thought that it could take over too much of a small playground and should not be allowed when younger children were out on the playground at the same time as the older pupils. One school had *'banned football from the main playground but now [did] it in fenced all weather surface area' (Respondent).* Sixty-nine percent of participating schools still allowed football to be played when weather conditions deteriorated.

Play fighting, wrestling and 'rough play' were banned categorically in a number of schools. They were considered to be too dangerous and nearly always caused real arguments, fights or injury. One school allowed sword and shield play-fighting under supervision. Some schools did not allow games when they were not being played correctly or where there was further potential for injury. For example, several schools named 'conkers' as a game that was banned due to lack of sufficient space. Snowball fights were also discouraged as well as the creation of ice-slides and sliding down grassy banks. Some schools banned rougher, more violent versions of 'tag' such as 'Deadmans Hunt'.

Forty-six percent of responding schools sometimes banned other activities, often related to climbing and gymnastics. Gymnastics and 'advanced gymnastics' for example were not favoured at some schools due to injuries and were usually allowed only on suitable surfaces. Climbing trees was sometimes banned for a variety of reasons such as the ground being unsuitable for falls or the trees being considered unsuitable for climbing. Sometimes, there was simply a perception that climbing trees was dangerous. One school had banned bottle flipping and another, skipping ropes because of there being too many accidents with them. Other respondents were keen to explain their schools' rationales behind bans as shown in the following quotes:

> *…'If children have repeatedly broken rules and are not behaving safely the decision might be taken to 'ban' something. There are no blanket bans…'*

> *'…No particular activities [are banned]. It's the behaviour around the game that can become excessive rather than the game being overtly dangerous. Eg. hard tackling in football is banned, whilst football is acceptable, thumping a person to tag them is banned although tag is acceptable…'.*

5.4.7 SOCIAL FACTORS

5.4.7.1 CHILDREN

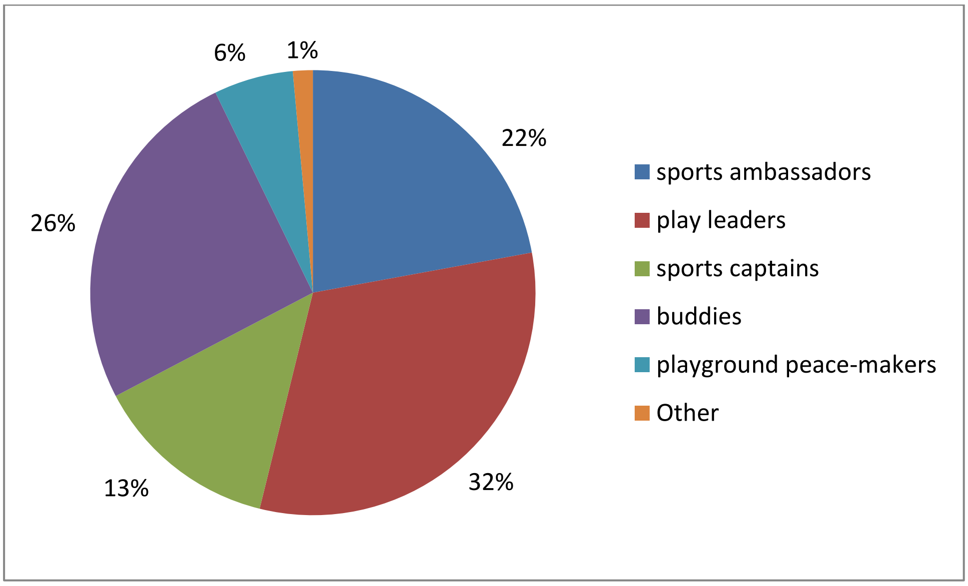


Figure 5.2: Roles taken on by children at participating schools (% schools)

The roles taken on by selected children during break times are illustrated in Figure 5.2. Two schools, forming 3% of respondents itemised '*referees'* and '*playground monitors to put out equipment in zones*' as further roles. Most schools (91%) provided training for all positions.

Some schools had more than one role operating in the playground. The number of roles on offer by schools is shown in Table 5.15.

Number of roles offered	0	1	2	3	4
Number of schools (%)	2 (3%)	19 (28%)	28 (41%)	15 (22%)	4 (6%)

Table 5.15: Number of roles offered by schools

When asked if bullying was a problem in the playground, 42 (62%) respondents chose the 'no' option, 26 (38%) responded with 'occasionally' and only 1 reported that bullying was a problem. One school marked both 'no' and 'occasionally'.

5.4.7.2 ADULTS

A variety of adults were reported to promote actively or join in with children's activities in the outdoor environment at break times. At a quarter of the schools, mid-day supervisors encouraged children to be active. In a smaller proportion of schools, teachers (22% schools) and teaching assistants (22% schools) supported children's PA and in fewer still, external providers (16% schools) and head-teachers (11% schools) actively supported children to take part in break-time PA. People in other roles were sometimes also employed to encourage children to be active at playtimes as part of their job. These roles included 'play leader,' 'sports coach,' 'PE instructor' and 'PE apprentice.' Students also offered their time on occasion during breaks to help children to be active in the outdoor environment.

Adults were deployed in a variety of ways during break times (Figure 5.3) although at nearly all schools during play-times, their main tasks were to manage disputes (play-time: 93%, lunch: 96% schools) and to monitor the playground (play-time: 93%, lunch: 96% schools). At a large proportion of the schools, adults provided support for vulnerable pupils at lunch times (76%) and break times (68%). Adults were considerably more involved in getting equipment out and encouraging its use at lunch-times as well as instigating games than during other breaks. Sixty-five per-cent of the participating schools had adults who joined in with the games and acted as referee over the lunch time period. One respondent to the QSOE identified direct adult participation at break-times as being an important target area for improvement at their school and thought that '*…only a few teachers actively promote outdoor activities and join in with the children but this is a school improvement and next academic year every teacher must be doing it at least once a week if not once a day…*'

Some schools mentioned additional duties carried out by staff at break times. Three (4%) mentioned that they had 'Lunch clubs' where structured activities run by adults took place. Another school listed 'first aid' as a duty that needed to be undertaken.

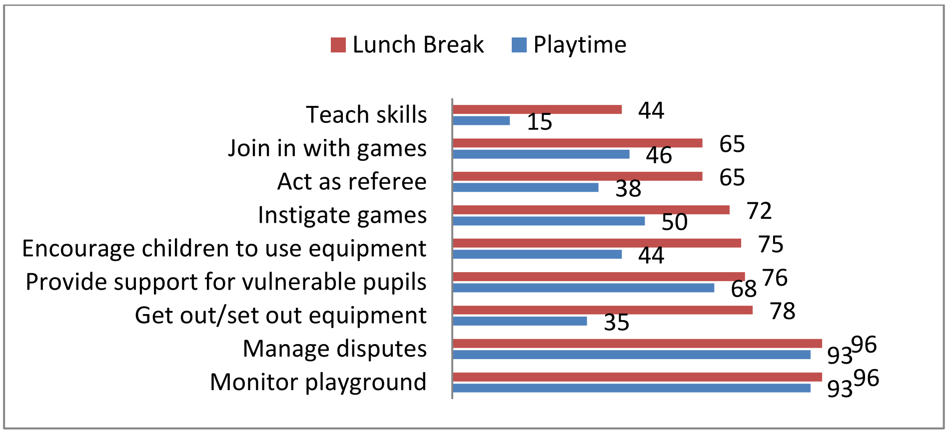


Figure 5.3: Adults' tasks at break-times (% schools)

5.4.8 VARIETY OF SPACES IN THE PLAYGROUND

Schools showed great variation in the number of spaces that they could offer to children in their outdoor environment (Table 5.16) ranging from between 1 to 17 different types of space (Median=10).

All schools reported that hard play areas were present in their outdoor space and 81% of the 68 schools had a field. Other features that were frequently noted included marked zones for play (75%), gardens (71%) and wildlife areas (69%). Over half of the schools had wooded areas (59%). Approximately one fifth of the schools had additional areas outside the school which they could use for outdoor pursuits.

However, simply having a feature present did not necessarily mean that it was always used. Of the schools reporting that they had a field, approximately 35% of those only used it in the better months of the year and the others used it 'at any time of year when weather conditions are suitable.'

Spaces	Number of Schools Reporting Feature (/68)	% Total
hard play area/s	68	100
field/s	55	81
marked zone/s for play	51	75
garden/s	48	71
wildlife area/s	47	69
shaded area/s	45	66
designated quiet area/s	44	65
pathways	41	60
wooded area/s	40	59
covered area/s	39	57
outdoor spaces used as work spaces	36	55
grassy bank/s	35	51
fenced/walled area/s	33	49
slope/s	28	41
outdoor areas designated for transition children (Y1 in primary schools or Y3 in junior schools)	28	41
pond	27	40
small area/s between buildings	23	34
multi-weather surface area/s	22	32
use of additional areas outside the school	13	19
SMOOGA arena	1	1
other (fire circle, stage, willow classroom, willow maze, bee-hive area, prayer garden, outdoor library)	4	6

Table 5.16: Spaces in participating schools

In wet weather, one school described how *'the field is used but in supervised groups rather than whole school' (Respondent).* Similarly, many schools reporting the presence of a wood used it only when the weather permitted (62%). Of the 48 schools which had a wood, 19% used it as part of a regular rota system and 17% as a routine part of break times. Wooded areas were used as part of lessons by 46% of schools which had those spaces and only occasionally by 19% of schools with that facility.

Schools also varied in the extent to which they allowed children to use the playground for active play in the periods before and after school. In the fifteen minutes before school, 57% of the schools allowed children to play in the school grounds with only 36% of schools allowing access for play in the fifteen minutes after school finished.

5.4.9 OUTDOOR EDUCATION

Schools reported a varying allocation of time to outdoor education as shown in Figure 5.4. Recent training in outdoor education had been undertaken at 54% of the schools. Forest Schools activities were provided by 65% of participating schools and clothing items such as wellies, raincoats or sun-hats for children to borrow so they could work/play outside in all weather conditions were provided by 62%. Eighty-four percent of the schools had a garden which could be cultivated by the pupils, 40% had a pond which was used for learning opportunities and 55% had covered areas in their grounds which were used as work spaces.

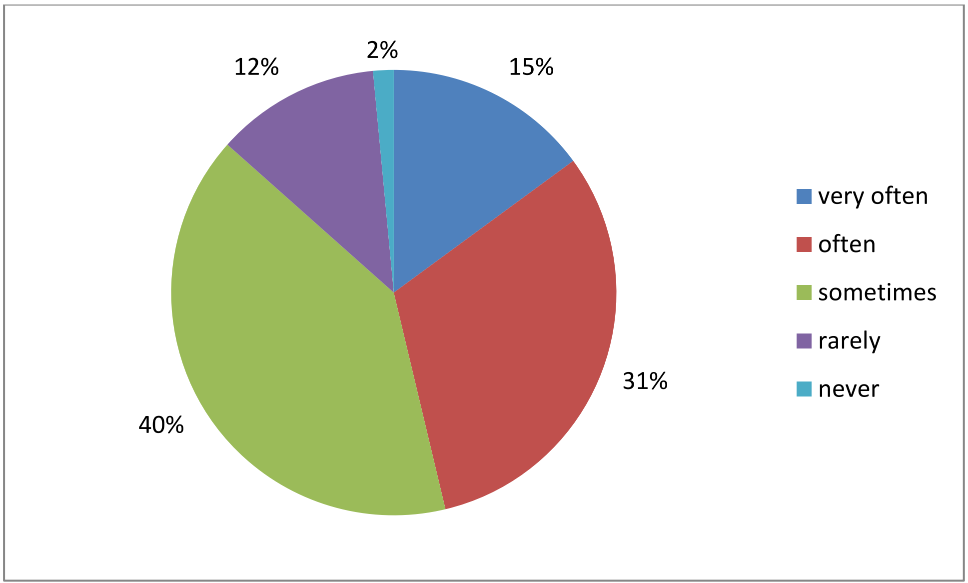


Figure 5.4: Proportion of schools that taught lessons outside (%)

5.4.9.1 PHYSICAL EDUCATION IN THE OUTDOOR ENVIRONMENT

The majority of schools in this study provided at least 2 hours of PE each week for pupils in KS1 (74%) and KS2 (80%). In the schools which had KS1 classes, out of 58 schools which responded to this question, 7 (12%) offered their KS1 pupils less than 2 hours of PE per week and 8 (14%) provided PE sessions for more than 2 hours each week. Of the 65 schools which stated how much time was allocated for PE in KS2 classes each week, only 4 (6%) planned for less than 2 hours. Nine schools (14%) allocated over 2 hours of time to PE, with one school putting in 4 hours.

Twenty percent of respondents had policy in place which detailed how much of the allocated PE time should be spent outside each week. Descriptions of the policy included that PE should be taught outside '*as much as possible*' (2 schools), to '*follow National Guidelines and cover the programme of study*' (2 schools), '…*one designated outdoor PE lesson led by school's sports coach*…' (1 school) or ' *all-we have no hall or gym'* (1 school). One school stated that there is *'not a formal policy but it is general procedure that each class have on outdoor PE lesson a week (weather permitting)* and 3 others also provided for at least 1 hour of PE outside each week. Two schools allocated 2 hours a week for PE outside and 1 school specifically did not have a policy for how much PE should be taught outside because *'some weeks we will have lots of physical [activity]opportunities and we do not wish to limit this.'*

If the weather was bad when outdoor PE was scheduled, most schools moved the lesson into a hall which was usually timetabled to provide for that eventuality. Lessons were sometimes adapted to suit the indoor environment. Often, schools continued lessons outside until weather conditions become extreme although this depended on the health and safety risk assessment on the day which meant that some activities might be limited as illustrated by the following respondent:

> *'We do not play hockey in the snow or play football when the playground is covered in ice. At these times we would either reschedule or provide an alternative activity in the school hall if this was possible.'*

Sometimes, PE lessons were re-arranged for another day or some form of in-class exercise was implemented instead. At one school, partition walls between classes were moved to create a space for PE. At another, a barn was used and one school had a dedicated gymnasium.

5.4.10 AFTER SCHOOL PROVISION

Figure 5.5 shows the percentage of participating schools providing after school activities of various types. Multi-skills (76% schools), boys' football (75% schools), mixed football (71% schools) girls' football (68% schools) and netball (62% schools) were offered by a large proportion of the schools. Just over half of the schools ran athletics (54%) and dancing (51%) activities after lessons had finished. Cricket was offered by 44% of the schools and tennis and cross-country by 41%. A wide array of other choices were also offered in a smaller proportion of the schools as shown in figure 5.5.

5.4.11 ADDITIONAL POLICIES

As well as detailing guidelines relating specifically to the use of spaces and playground equipment, schools commented on some more general school policies through the survey. When asked if their schools had a clearly stated set of rules for playground behaviour, 79% respondents agreed although only 53% reported that the rules were displayed clearly for children to see. Ninety-seven per-cent of responding schools indicated that their pupils regularly took part in physically active inter-school activities.

With regard to wet weather policy at playtimes, 84% schools encouraged children to play outside until the weather was extreme and at 15% of the schools, children had access to sheltered areas so that they could continue playing outside even when conditions changed. At 29% of the schools, children had access to indoor areas for active play when the weather deteriorated. However, when this was not possible, children were sometimes asked to remain seated indoors (29% schools) when the weather was bad or provided with films to watch (24% schools). At a small percentage of schools, children were allowed to play outside in all weathers (1%) or to choose whether to play inside or outside when the weather conditions were bad (3%).

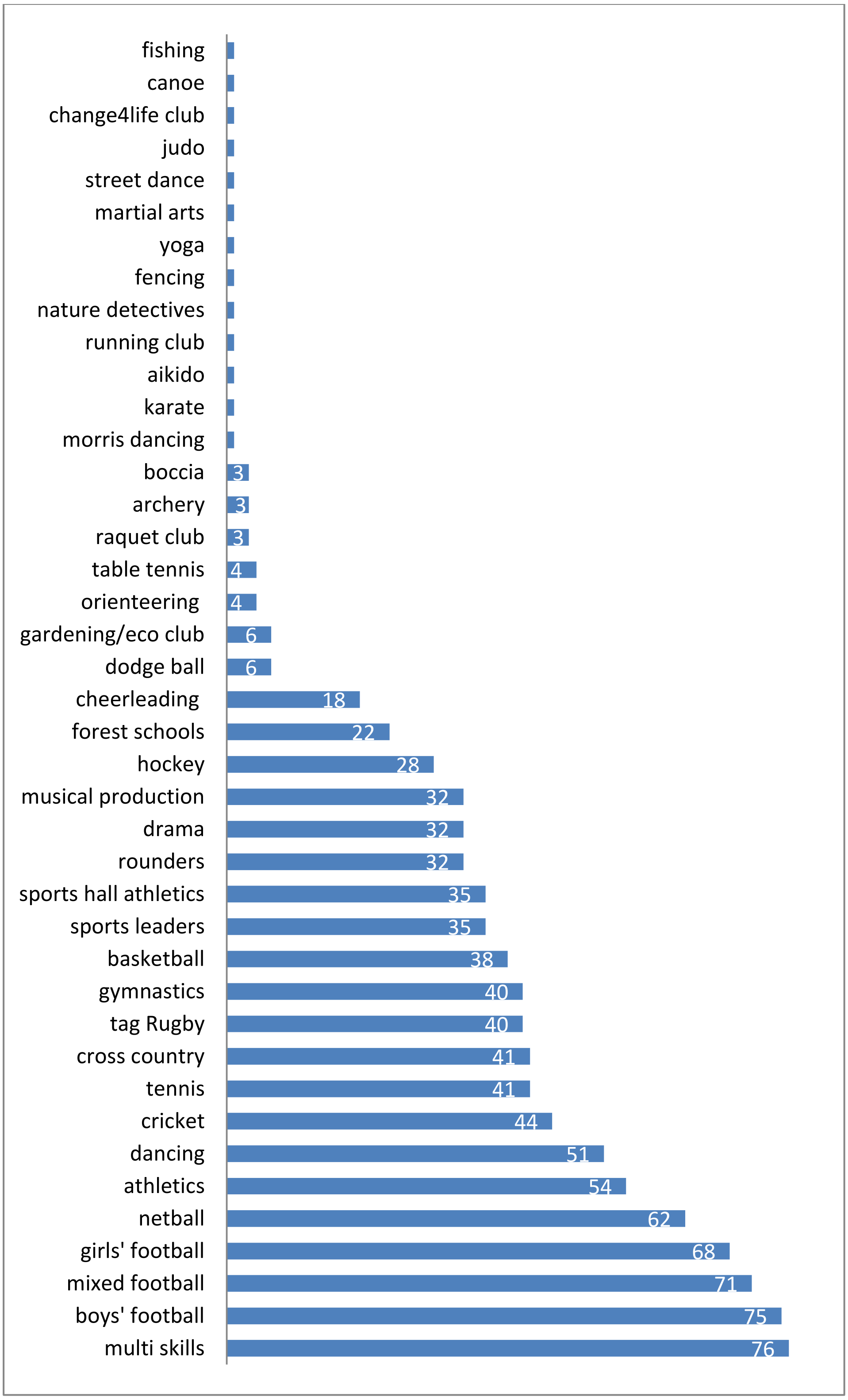


Figure 5.5: After school provision in participating schools (% schools providing provision)

5.5 DISCUSSION

The QSOE was found to be a useful tool for collecting extensive information from state primary schools in England about the nature and use of their outdoor spaces. Physical, social and policy aspects of outdoor PA provision were reported, thus enabling a broad description of school provision to be made. The format of the QSOE seemed to be conducive to full completion of the questions, to a large extent, although it is not clear how accurate the responses were to a more sensitive question relating to the negative social behaviour of bullying. Few questions were left unanswered and free-text options were readily completed. There was a very low response rate to the QSOE when school recruitment and survey completion were online. Alternative methods for engaging schools might need to be considered for achieving higher levels of response.

5.5.1 PHYSICAL ASPECTS OF PRIMARY SCHOOL OUTDOOR ENVIRONMENTS

Many schools responding to the QSOE reported the provision of a wide variety of types of loose and fixed equipment for children to use when they were outside and detailed information about the specific types of equipment on offer to children being active in the outdoor environment. Other questionnaires of UK schools have reported the presence of fixed and moveable playground features as composite totals, without information detailing specific equipment. Proportions of schools reporting the presence of fixed/loose equipment have varied between 94%/98% (Baines and Blatchford, 2019), 70% (Semble, 2019), 47%/3% (Jones et al, 2010) and 22%/47% (McKendrick, 2005) in a variety of UK schools demonstrating the considerable variation that can exist in school environmental provision even within the same country. Internationally, too, there is considerable variation. Hardy et al (2016) reported 77.8% urban Australian schools with fixed equipment and 94.4% having sporting equipment such as bats and balls whilst Portuguese schools have been reported to have no playground equipment at all (Broyles et al, 2015) or only to have fixed equipment at 26% of schools (Semble, 2019).

It can be seen from the current QSOE study and other questionnaire results that schools' provision of equipment varies widely, although it is not always clear what exactly comprises that variation. Knowledge of the particular elements that make up playground provision could offer valuable insight into how others respond to the challenge of creating spaces that appeal to young people and might encourage active behaviours. In the current study, for example, 27 unique fixed facilities were reported across the 68 schools. In a sample of 99 Norwegian schools, more than 50 types of permanent play facilities were noted (Dalene et al, 2016). Of those items, swings were reported to be present at 94.5% of the schools, compared with at 4% schools that responded to the QSOE, climbing frames at 87.9% of schools as opposed to 46% of schools in the current study and soccer goals at 85.5% of schools with 66% schools reporting that feature through the QSOE. Whilst the impact of fixed equipment provision per se on children's PA is not clear (Dalene et al, 2016; Nielsen et al, 2012), it is interesting to consider how differences in provision might reflect cultural and financial support or constraints.

Some schools responding to the QSOE had a wide range of spaces in their grounds for children to use with over half having ten or more different types of area. A Norwegian school survey also found considerable variation on offer in their facilities, with 65% elementary schools having 6 or more outdoor area types (Haug et al, 2010). Fields were present at a high proportion of all schools and are a feature which has also been reported in a high proportion of other UK and many International schools (Baines and Blatchford, 2019; Broyles et al, 2015; Chancellor, 2013; Hardy et al, 2016) and gardens and wildlife areas were common, too among schools in the QSOE. Most English schools responding to Blatchford and Baines' (2019) survey also reported the presence of greenery, planting, shrubs or gardens, with increases in provision since 2006. At well over half of the schools in the QSOE, however, seasonal and weather changes affected the use of the field and other green spaces such as areas of woodland, limiting their potential for PA promotion.

Schools in this study were, on the whole, satisfied with the size of their outdoor space, with 81% agreeing that children had sufficient space to play. This was a perception echoed by many schools in Scotland where 69% of respondents thought that their primary school grounds too were 'about the right size' (McKendrick, 2005) and only about a fifth of children in a UK survey of English and Welsh children were concerned about a lack of space at break time (Baines and Blatchford, 2019). In a survey of Australian schools, too, 79% respondents believed the size of their playground to be adequate (Chancellor, 2013) and Hardy et al (2016) also reported that 85% head-teachers completing a school environment questionnaire in NSW indicated that their school green spaces were adequate for play.

5.5.2 SOCIAL CONTEXT OF PRIMARY SCHOOL OUTDOOR ENVIRONMENTS

A specific aim of the QSOE was to collect information about social aspects relating to children's PA in the outdoor environment and the questionnaire format enabled a considerable amount of information to be relayed about adult and child actions and interactions thought to be important for PA. Adult support in a variety of forms was reported to be present in most schools at lunch-times, although active participation and input of adults were engaged in less frequently, particularly during the shorter breaks of the day. In a survey of Flemish schools, too (Cardon et al, 2012), fewer than half of the schools involved had adult-led PA and sports' activities during lunch breaks. As seen above in section 5.4.7.2, one school was working towards putting more adult-led activities into their outdoor time, having identified adult involvement as an important area for school development. However, as an approach for fostering children's PA, 'encouraging staff members to be involved in lunchtime physical activity programs' was found in Australian schools to be one that was more likely to be 'never' used, perhaps because of the time commitment involved (Hardy et al, 2016).

From a child's perspective, the importance of adult engagement has been acknowledged in a survey of English schools (Blatchford and Baines, 2019) in which nearly a quarter of Year 5 children thought that there were not enough supervising adults on the playground at break times and 46% respondents reported that they participated in adult organised team sports during break times. As the QSOE was completed by adult respondents, a child's view could not be assessed in the current study.

In the QSOE survey, all apart from 2 schools appointed children to perform designated duties during break times. Few other surveys have collected this kind of information about the types of adult sanctioned roles of responsibility for children in the playground. In Baines and Blatchford's survey (2019), the numbers of children utilised in a 'supervisory category,' including roles such as 'prefect' at break times were presented, with all types of role collapsed into one category and schools were found to vary greatly in the number of children with supervisory roles. McKendrick et al (2005) noted that a fifth of primary schools used 'prefects' to help monitor the playground.

5.5.3 PRIMARY SCHOOL POLICY RELATING TO THE OUTDOOR ENVIRONMENT

While most of those completing the QSOE survey thought that their schools made equipment freely available to children for children's games, fewer than half of the schools actually allowed children to use equipment at all break times. However, a sizeable proportion of schools did provide the opportunity to play a range of games through their after school clubs for children who were able to access those. Out of hours team sports were found to be on offer at 84% of the UK schools surveyed by Baines and Blatchford (2019) although out of school hours programmes of any kind were available at only 59% Australian schools (Chancellor, 2013) and 33% Scottish schools (McKendrick, 2005).

In the area of outdoor education, fewer than half of the schools responding to the QSOE reported that they 'often' or 'very often' allocated time for learning outside of the classroom with just over half of the schools having recently undertaken training for staff relating to working outside. However, there is, perhaps, some evidence from the QSOE that schools might be starting to integrate ideas from the outdoor education movement into their work. Many responding schools, for example, were incorporating activities such as forest schools into their timetable and providing clothing to enable children to be out in all weathers, as well as making gardens, wildlife areas and woodland available to their pupils. A smaller number of schools also had features such as ponds, bee-hive areas, a fire circle or willow mazes for engaging children's interest in the outdoor environment. Responses to questions about after-school provision of activities also reflected some focus on outdoor learning pursuits. One respondent described their school's '…*Nature Detectives…'* club as being *'…a bit like forest school, minus the forest...*' and other respondents reported having *'gardening', 'eco,' 'change4life,' 'outdoor'* and '*fishing'* clubs on offer to children at the end of the school day. In a survey of English schools examining changes in outdoor education between 1995 and 2017, Prince (2019) noted an expansion of facilities for outdoor learning with schools more recently reporting the presence of areas such as gardens, vegetable plots and forest school gardens and data from a sample of Scottish schools, too, (Christie et al, 2014) showed that there might be a shift in provision for outdoor education as primary teachers reported that their use of school grounds for learning had increased over 5 years.

Despite PE being the subject most aligned to the national curriculum demands which state that children should '*take part in outdoor and adventurous activity challenges,'* (Department for Education, 2013) only a fifth of the schools responding to the QSOE had a policy which outlined the expectations for PE in the outdoor environment and only a quarter participated in the 'daily mile'. In Prince's (2019) survey, 83% schools reported that PE was their main curriculum area for outdoor learning. The QSOE did not specifically investigate the delivery of curriculum subjects through outdoor learning and it could be that in QSOE schools, PE is delivered outside in more schools than in the low percentage that reported having a formal policy.

Most of the schools in the QSOE survey encouraged children to be outside during break times even when the weather deteriorated and some schools enabled active playtimes through shelters or alternative indoor spaces. The results of the QSOE conflicted somewhat with Blatchford and Baines' survey (2019) in which only just over 10% schools reported that children were allowed outside during wet break times and 'Project Dirt's' survey of teachers taking part in 'Outdoor classroom Day' which reported that 76% of the UK teachers in their survey thought that the weather would be a barrier for taking children outside, with only 16% stating that 'nothing prevents children from playing outdoors.' The reasons for these conflicting results are unclear and could, perhaps be to do with the school ethos in the self-selected sample responding to the QSOE. Details about the school sample in 'Project Dirt's' survey are also not known.

Safety issues were highlighted in the current survey by respondents reporting information about the limitations their schools placed on children's games and activities in the playground. Free-text answers allowed respondents to expand on the reasons for banning games and activities and nearly every school reported similar types of restrictions on children's play. In another survey of English schools, 28% of Year 5 children who responded to a questionnaire about break times in 2017 thought that having enjoyable activities such as running, playing on equipment, or games banned was one of the main challenges to contend with in their free time compared with only 13% in 2006 (Baines and Blatchford, 2019), indicating a rise in bans of some playground pursuits over the time period. It can be seen from responses to the QSOE that the banning of some pursuits such as gymnastics activities, specifically handstands and cartwheels, or, maybe complex balances performed in cheerleading might have more of an impact on girls' PA as these types of activity were reported to be more frequent in girls than in boys.

An excess focus on safety may hinder normal development through reducing the opportunities for risky play, defined by Sandseter and Kennair (2011) as '*thrilling and exciting forms of play that involve a risk of physical injury,'* thus preventing children from developing the ability to handle and assess risk. Activities most often banned were of the 'high speed,' 'great heights' or 'rough-and-tumble' type described by Sandseter as play that adults and children alike perceive to be risky and could offer challenge and excitement which might encourage some children to be more active. Providing some more challenging climbing opportunities within the confines of a supervised and safety conscious setting might offer the element of risk that some children need to motivate them to engage in a range of active behaviours. In the current survey, fewer than half of the schools reported that they had any climbing frames or climbing walls and only one quarter had monkey bars.

Guidance from the Health and Safety Executive, (HSE, 2012) states that adults who provide play opportunities need to achieve a balance between minimising serious risk and allowing children to benefit from play within proportionate controls. Whilst, in practice, this might prove to be difficult for schools to interpret with any confidence, leading to them to err on the side of caution, research evidence and official guidance support the idea that some level of risk is important for children's active, risky play and development (Brussoni et al, 2012; Farmer et al, 2017; HSE, 2012). One QSOE respondent reported a '*large, natural tree climbing area'* and another added '*conkers*' to the list of equipment available at their school, whilst around a quarter of girls and nearly a third of boys were reported to play bulldog during break times at schools which responded to the survey. This could indicate that some schools do, perhaps accept and encourage a higher level of risky play in their outdoor environment.

5.5.4 ELEMENTS OF QUESTION DESIGN

Whilst there is some debate about the benefits of 'other' and free text responses in surveys (O'Cathain and Thomas, 2004), the inclusion of open-ended questions during survey piloting is thought to be important for determining closed-question categories in a final survey (McColl et al, 2001). In the case of this pilot study, they proved to be advantageous for identifying additional equipment and spaces that characterised primary school outdoor environments, not already included in the multiple-choice selection, helping to obtain a more complete description and to inform response categories for future versions of the questionnaire. All respondents that chose the 'other' option provided extra information. In addition, where open ended questions were asked so that respondents could elaborate on closed answers many schools chose to respond and where new information was solicited, over 75% schools responded each time.

Despite there being already long lists of options for some questions, it appeared that this did not deter respondents from selecting options further along the list. When items that are likely to be more relevant are placed earlier in a list, as in the QSOE, thus increasing the relevance of the question, respondents have been found before to be more likely to complete the question (McColl et al, 2001). Items were also presented in small groups horizontally in the questionnaire, thus allowing respondents to scan across all options quickly. Missing answers were only found in Question 14 which asked respondents to state when fixed equipment could be used. Thirteen responses were missing for the 'before school' option, 12 responses for the 'after school' option and 7 for 'in all weather conditions.' This level of detail about school policies might be more realistically obtained through direct observation and a closer relationship with the school during a research process.

With regard to collecting sensitive information, one question (Q.43) was for the purpose of gaining information about negative behaviour in school playgrounds. In a previous survey of English school children (Baines and Blatchford, 2019) over half of the Year 5 pupils who responded thought that poor behaviour of some children was one of the main challenges to overcome at break times. Only 1 school responding to the QSOE reported that bullying was a feature of playtimes with well over half of the responding schools indicating that bullying was not a problem and a quarter stating that it happened occasionally. This could reflect a pattern found by Lee et al (2008) where the proportion of children who indicated that they had been bullied over the past 2 weeks at different schools varied between 2.3% and 42.1%. However, alternative explanations could be that schools interpreted the word 'bullying' in different ways or respondents could have felt uncomfortable about admitting that bullying behaviours occurred at their schools. School staff may also not always notice secretive malicious behaviours. In order to obtain information about negative behaviours, questions which define behaviours more explicitly or which require respondents to count occurrences of behaviours in school incident records might be more useful.

Subjective appraisals of the school landscape and perceptual items generally, have been shown previously to be less reliable than reports based on directly observable features (Broyles et al, 2015; Jones et al, 2010). In this study, the objective estimate of the school grounds being correlated with subjective measures of area provided some evidence that the respondents' ratings of space did, perhaps, reflect the space that was available. Pawlowski et al (2019b) also reported that children's perceived capacity of their schoolyard seemed to match the actual size of the schoolyard. A more accurate objective measure would clearly be advisable for providing stronger validation of the subjective ratings as the 'Google Earth' estimates were very basic and could have been flawed through misinterpretation of the images on 'Google-Earth' and inaccurate delineation of space with the area tool. However, it may also be important to consider that it is, perhaps the perception of space, rather than the actual size which might matter to children when they play. It is possible that the size of space in UK school grounds is more often than not perceived to be adequate by children as described above (Blatchford and Baines, 2019) and there are other features to do with the outdoor environment that are more pertinent to them for enticing them to be active.

5.5.5 ONLINE RECRUITMENT AND DISTRIBUTION

Difficulties with recruitment of schools have been a general issue in studies of this nature and for the QSOE, response rates were very low. In one Australian survey, nearly one quarter of schools that were contacted did not reply even after 5-6 attempts to invite a response (Hardy et al, 2016) which was, perhaps explained by schools that did respond, but declined to participate in the study of which more than a third stated that they were too inundated with requests or too busy to take part. Prince (2019) also abandoned the use of an on-line survey due to poor response rates and requested further information from schools by post.

Baines and Blatchford, (2019) concerned about the potential for emails to get lost in a deluge of correspondence, piloted varying methods of questionnaire distribution and found that only 20% of their pilot emails were even opened. In the event of their main survey, which offered schools the choice of postal or electronic questionnaire return, very few on-line responses were returned (4% of all responses) from a 27% response rate. A higher response rate of 33% for an online survey was obtained from Belgian schools (Cardon et al, 2012) perhaps because it was delivered through the email system in 2009 before this method of communication became so heavily used and demanding of time and attention. Chancellor (2013) obtained a 22% e-survey response rate from Australian schools. A higher response rate of 38% has been obtained from postal questionnaires offering an option for completion electronically (Blatchford and Baines, 2006) and paper based surveys have also yielded higher rates of participation of 59% (Van Sluijs et al, 2011) and 71% (Haug et al, 2010).

As seen in the Methods section above, numerous avenues were explored for recruiting schools to the study after email invitations and follow up calls proved to be unsuccessful for signing up new schools. An e-survey method had been chosen for its advantages regarding low-cost and ease of administration and, based on Chancellor's (2013) 22% response rate, for 100 returned surveys, this would have involved sending approximately 500 e-mails. However, during the course of the study, over 5 times this number of schools were invited to participate in the QSOE survey, eliciting only 68 responses.

An alternative approach might be to invite schools to complete the survey by interview, either over the phone, face-to-face or through a video conferencing platform on-line such as 'Skype', 'Zoom' or 'Facetime'. Some preliminary findings about using the 'Zoom' video facility for qualitative data collection have shown, despite some technological challenges, that participants and researchers have thought it to be convenient, cost and time effective, whilst enabling contact between people who are geographically distant. It was preferred over telephone or email as users liked being able to engage with each other by using non-verbal cues which enabled the establishment of a personal connection and facilitated good communication (Archibald et al, 2019). Being committed to a specific appointment via the internet could encourage some school staff to engage with the completion of a survey in this way. There is still, however, a difficulty in reaching those respondents.

Most schools only advertise a general office email address through which all emails are filtered and it is usually not possible to speak to school personnel directly. Messages left at the office inviting staff to call back did not elicit responses in the current study. The most successful means of recruitment was through a snowball method, either by head-teachers reaching out to others in their school networks or through contacts known to KW highlighting the study via their social media pages. Another possibility could be to contact members of a school's governing body or parent-teacher association as they have access to school facilities and personnel and might have some influence in deciding whether or not a school might complete a survey or complete it themselves on behalf of the school.

5.5.6 FUTURE DEVELOPMENT OF THE QSOE

For accurate assessment of school environment characteristics steps need to be taken to demonstrate reliability and validity of any instrument that is designed to measure aspects of that environment. In its current stage of development, reliability and validity have not yet been adequately established for the QSOE. A questionnaire's reliability can be described in terms of the degree to which consistent or repeatable responses can be obtained through its use on multiple occasions (Ahmed and Ishtiaq, 2021; Bolarinwa, 2015). One way to measure reliability is through test-re-test procedures where respondents would be asked to complete the QSOE at two different time points so that agreement between the two sets of responses could be established. Other school environmental questionnaires that have been assessed in this way have been found to have high item response reliability (e.g.Cardon et al, 2012; Lounsbery et al, 2013).

Inter-rater reliability (Ahmed and Ishtiaq, 2021; Bolarinwa, 2015) demonstrating consistency of measurement between raters has also shown that school audits of the physical environment can provide reliable information (Broyles et al, 2015). In the current study, a high level of agreement was found between school responses to the QSOE on a sub-set of 33 items relating to the physical domain of the school environment and the researcher's own observation of the same facilities. Future inter-rater reliability testing could also include items from the social and policy domains of provision.

An internal consistency reliability analysis can also be used to indicate the degree to which items in the survey instrument are measuring the same construct through the use of Cronbach's alpha (Tavakol and Dennick, 2011). In the current study, a preliminary analysis was conducted using Cronbach's Alpha with a view to creating an index based on items which were internally consistent and could be used as a measure of the quality of school outdoor environmental provision. However, there was no evidence found of a unifying factor in the data and scores derived from preliminary attempts were unstable, changing significantly with slight modifications of the procedure.

Questionnaire validity can be said to be the extent to which it measures what it is designed to measure (Ahmed and Ishtiaq, 2021; Bolarinwa, 2015). There are several types of validity testing, including face validity, content validity and predictive validity (Ahmed and Ishtiaq, 2021). Face validity involves an evaluation of the questionnaire items by experts in the field that is being measured through an 'on the face of it' examination (Bolarinwa, 2015). In the case of the QSOE, this was achieved to some extent by a head-teacher and teaching assistant who completed the survey and commented on its suitability and omissions. A more formal process could involve a larger sample of school experts who could review the QSOE and discuss its suitability.

Content validity is an assessment of how well the instrument fully measures the field of study (Bolarinwa, 2015) and in the case of the QSOE, three academic experts in the field reviewed QSOE items and gave their opinions about items in the survey as one measure of content validity. The next stage in determining content validity might be for each reviewer to assign a rating for each item with a pre-determined level of agreement defining which items remain in the survey (Bolarinwa, 2015). Additional validation of content could be explored through the use of exploratory factor analysis (EFA; Taherdoost et al, 2014) which enables the exploration of underlying constructs/dimensions that are being measured by the survey instrument. Cronbach's alpha could then be calculated for each of the constructs as well as for the entire instrument (Tavakol and Dennick, 2011). The low response rates to the QSOE in the current study precluded the use of EFA.

Predictive validity represents the capacity of a test to predict behaviour (Bolarinwa, 2015). For an instrument assessing the quality of provision for PA, therefore, where a school is assessed as providing well for children's PA, it would be expected that children would be more active. Jones et al (2010) as an example measured predictive validity of the separate components of their school audit tool and found that children's PA was associated with some components so that at schools with the highest scores in those components, children were more active. Other environmental measures have also been tested for predictive validity in this way (e.g. Spittaels et al, 2010). It is suggested that after factorial analysis and testing for internal consistency with Cronbach's alpha, predictive validity could then be ascertained by examining associations between QSOE dimensions and children's self-reported or objectively measured PA.

As there were some questions, as shown in Table 5.4, for which there was no variance in responses, these could be removed as response options in future versions of the QSOE as they do not discriminate between schools that offer high or low levels of provision for PA in the outdoor environment. However, it could also be argued that the exclusion of Q.7-1 and Q15-6, which request information about the presence/absence of hard play areas and playground markings, would reduce the face validity of the instrument.

Question Item
Q7-1 Which of the following spaces do you have at your school? Please select all that apply. - hard play area/s
Q7-b-1-5 Space is…not well utilised
Q8-3 If your school has a field, when are children allowed to use it at break times (including lunch-break) ? - not at all
Q9-5 If your school has a woodland area, please indicate when children are allowed to use it. - not at all
Q11-5 If your school provides loose equipment for children to use at break times, which year group/s is it available for? - loose equipment not available
Q12-5 When is loose equipment available for children to use? - not at all
Q15-6 Please indicate which of the following types of marking you have in the outdoor environment at your school. - no playground markings

Table 5.17 QSOE items with no variance in responses

5.5.7 STRENGTHS AND LIMITATIONS

A strength of the QSOE is that it was a survey developed from first-hand information in the setting for which it was needed, thus ensuring that it was relevant and specifically designed for recording information about primary school provision for PA in the outdoor environment. As an online survey, the QSOE was low-cost and reasonably low-burden to distribute although there was some difficulty in obtaining current email addresses for schools. While there were publicly available lists of schools, these did not include email contacts and so each school address needed to be looked up individually. The QSOE consisted of questions that could be easily answered by any member of staff that knew the school well so that, in the main, specialist knowledge was not required to complete the questionnaire. Long-answer questions were made optional and the multiple-choice and tick-box style response items allowed for quick and easy completion with on-line delivery allowing for effortless return. Whilst a number of studies have been based solely on audits of the physical environment, (Broyles et al, 2015; Jones et al, 2010), the QSOE collected information across physical, policy and social domains of the socio-ecological model.

However, there were also several limitations. The low response rate to the QSOE survey likely introduced bias due to self-selection. The extent to which the QSOE is an accurate and reliable method of collecting data about school outdoor environmental provision is not known and within the remit of the current study was difficult to establish. Schools were not able to provide the necessary time and staffing to allow for a researcher to count resources, and talk to staff about facilities or for staff to complete the QSOE more than once.

Although the QSOE was derived directly from opinions of adults and children in UK schools and from the academic literature about what might facilitate children's PA, it did not cover all aspects of the outdoor environment. The aesthetics of school spaces for example, the condition of facilities (Baines and Blatchford, 2019; Hardy et al, 2016) and the presence of features outside the school entrance which might support active transport (Broyles et al, 2015; Jones et al, 2010), ratios of staff to students (Baines and Blatchford, 2019) or the role of parental involvement (Cardon et al, 2012) have been of interest to some researchers and included in their environmental surveys although they were not part of the QSOE.

The findings of the QSOE are also limited by the nature of the data that were collected. Even when an instrument is demonstrated to be reliable and valid, this does not, necessarily mean that its data are a dependable representation of reality (Einola and Alvesson, 2021). The extent to which questionnaire responses are a faithful representation of the environment and what the nature is of the responses are important considerations when drawing conclusions from survey data. Respondents may, for example, understand a word differently to the researcher (Hardy and Ford, 2014) or place different values on a particular environmental attribute (Carlson et al, 2017) resulting in data which do not align with the researcher's original intentions for the item. Social desirability bias might also sway some respondent's answers (Morgado et al, 2018).

The QSOE, for example, contained a mix of questions including some requiring the respondent to mark the presence or absence of school environmental features as well as questions which involved an evaluative process concerning attributes of the school environment indicated by estimations of time or space. As discussed above, inter-rater reliability for test items focussing on physical aspects of the environment, including in the current study, are generally high (e.g. Fairclough et al, 2012; Nathan et al, 2013). However, in these studies, reliability is, nonetheless, < 100%, even for marking the presence or absence of a physical school environmental feature. In the current study, disagreement was found between the researcher and one school representative on items such as the presence of ‘pathways,’ ‘shelters,’ ‘tunnels,’ and ‘swings.’ This could, perhaps be due to the school respondent’s greater knowledge of their own school setting compared with the researcher, differences in perception of the meanings of some of the words or, perhaps, a loss of focus during questionnaire completion by the respondent. Some respondents, anxious to portray their schools in a good light, might exaggerate their school’s provision. It can be seen that QSOE representation of the physical environment by a respondent on one particular occasion is not necessarily an objective characterisation and could have been reported in another way by another school representative.

Estimations of time allocations or space availability and size are inherently subjective appraisals and the extent to which QSOE responses would match objective measures of these concepts is not fully clear. Low to moderate agreement has been found between perceived and objective measures of the neighbourhood environment (Ball et al, 2008; Koohsari et al, 2014; Orstad et al, 2017). Some research, too, shows that perceptions of the environment are more likely to be mismatched to objective measures in some population sub-groups (Ball et al, 2008; Curl, 2018) such as in certain age groups, low income households, participants who enjoyed walking and residents who had lived in their neighbourhood for a shorter period of time (Ball et al, 2008) It could be in the current study that length of time at the school, age of respondent and general level of interest in the study could skew perceptions of school environmental attributes.

Although not obtained in this study, children’s responses to the QSOE might also differ from adults’ responses as children interact more immediately with social and physical aspects of their school environments. Gibson’s (1979) term ‘affordances’ refers to the way in which properties of the environment are interpreted uniquely by the observer and it may be that affordances could shape QSOE responses. One child might perceive a small, dividing wall in the playground as a ‘climbing wall’ whereas another could view it as a ‘seat’. Adults might be viewed as affording the opportunity to play games in one child’s perception, whereas another could see adults only as authority figures that curtail their activities. Thus children’s views of the world as elicited by the QSOE might not match an adult perspective derived from the same survey instrument.

Supplementing questionnaires with qualitative study is likely to reveal more about how respondents understand the items within a survey instrument (Einola and Alvesson, 2021) whilst, however, adding time, researcher and cost burdens which the use of the questionnaire aims to reduce. As different people might perceive the same objective environment in different ways resulting in varying effects of that environment on PA behaviour (Prins et al, 2009), it could be, too, that both objective and perceived measures of the same environmental characteristics are needed for full understanding of a defined environment (Orstad et al, 2017; Prins et al, 2009) and its influences on PA.

5.6 CONCLUSIONS

The QSOE was a useful tool for collecting detailed information about how children are supported by schools to be active in the outdoor environment ~~school outdoor environments~~ with the question format providing opportunities for comprehensive responses. However, as on-line distribution yielded a low response rate, future school surveys might be better distributed by alternative means. The findings from the QSOE indicated that many of the schools surveyed had a wide range of facilities and equipment available for use in their outdoor environments which might inspire children to be active and involve adults and children as facilitators of children's PA. Schools reported the presence of a number of policies to do with equipment availability, safety, weather or accessibility that could play a part in limiting children's scope for PA in the school grounds. Comparisons with other national and international surveys of the nature of school outdoor environmental provision showed that school provision for children's PA in the outdoor environment varies substantially between schools in different locations. Valid and reliable tools are needed to assess these differences and for schools to assess their own provision adequately so that the effects of interventions and changes can be monitored. Further development is needed to refine and validate the QSOE.

CHAPTER 6: WHICH ASPECTS OF THE SCHOOL OUTDOOR ENVIRONMENT ARE ASSOCIATED WITH CHILDREN'S SELF-RATED SCHOOL DAY PHYSICAL ACTIVITY?

6.1 INTRODUCTION

In Chapter 5, responses made by 68 UK primary schools to a survey designed to elicit information about their provision for PA in the outdoor environment were reported. A wide range of responses across the physical, social and policy domains of the socio-ecological model (Sallis et al, 1988) showed that provision for PA in that sample of schools is multi-faceted. In the physical and social realms, many schools provided a broad selection of fixed and loose equipment and a variety of spaces for use during the school day, alongside adult support in the playground and encouragement for children to be involved in their own capacity as leaders and facilitators. Results also showed, however, in the policy realm, that some school policies such as those designating time for outdoor activities and education, allocating resources for outside games or determining what children are allowed to do in their outdoor spaces are potentially limiting factors for children's PA.

In the current chapter, a study is reported which set out to gain more understanding of which of the many school-based resources reported in Chapter 5 by members of school communities that might facilitate or limit children's PA might have some bearing on children's PA when they utilise the outdoor environment. As, within the socio-ecological perspective, it is proposed that it is the interaction between individuals and spheres of environmental influence that will determine individual health behaviours such as PA (Stokols, 1992), knowledge of which of the many reported school environmental factors might be involved is crucial for understanding how to help schools to implement new strategies and interventions.

Physical, Social and Policy school-level variables were created from the QSOE survey instrument (described in Chapter 5) and used in multi-level regression models together with individual level age and gender data and subjectively rated PA of children at 12 schools where the QSOE had been completed, to identify school and individual level correlates of children's PA and their relative impact on children's PA. From a critical realist stance, regression modelling can be viewed as a useful tool in exploratory research, such as in the current study, for seeking out and assessing the strength of relationships between variables that could be suggestive of underlying mechanisms (Kemp and Holmwood, 2003; Mingers, 2006) which could then, in future work, form the basis for theory generation and testing to account for patterns that have been identified.

6.2 BACKGROUND AND AIMS

With UK schools being set the task of delivering at least 30 of the 60 minutes of children's daily recommended PA (DHSC, 2016) knowledge about 'what works' is clearly important for financial, educational and logistical reasons. As seen in Chapter 1 (Section 1.4.2), previous authors have noted significant variation in the level of children's PA between schools Gomes et al, 2014; Griew et al, 2010; Kristensen et al, 2013; Martin et al, 2012; Parrish et al, 2009a; Pereira et al, 2020) with the proportion of this variance that can be explained by school level factors varying substantially between studies, ranging from as much as 49.9% (Katzmarzyk et al, 2018) to 3% (Naylor et al, 2008).

As described above, from a socio-ecological perspective, multiple levels of personal, physical, social and cultural factors may play a part in influencing how active children choose to be (Sallis et al, 2008). School level influences in the outdoor environment could be those such as the presence or otherwise of playground markings in the physical domain, training children to take on specific roles at a social level or allowing/banning certain games or activities as a policy element. For schools to help children to meet advisory guidelines for PA, it is necessary to understand which school factors contribute from across the different domains.

Some positive associations between children's PA in school and aspects of the school's outdoor environment have been identified such as the presence of more permanent playground structures (Nielsen et al, 2012; Taylor et al, 2011), active adult engagement in the playground (Massey et al, 2018 ; Van Kann et al, 2016) or at schools which have established policies for promoting PA at school (Leatherdale et al, 2010; Faulkner et al, 2014). A few studies have examined strands of the ecological model together when considering the school environment in relation to primary children's PA. Those that have are focused on populations from Portugal (Gomes et al, 2014; Pereira et al, 2020), the Netherlands (Van Kann et al, 2016), Australia (Martin et al, 2012) or Canada (Ward et al, 2015). In the UK, school environmental correlates of children's PA have been explored to some extent in Norfolk schools (Van Sluijs et al, 2011; Mantjes et al, 2012).

There is no clear-cut consensus from these studies as to which school environmental factors impact on children's PA levels. Moreover, it is likely that geographical and cultural factors will affect which features are more salient in different regions. In the current study, the aim was therefore to extend the exploration to UK Midlands schools and to investigate in these the relationship between primary school children's self-rated PA and their school outdoor environments in terms of physical, social and policy elements.

6.3 METHODS

6.3.1 RECRUITMENT

Participants were children in years 5 and 6 attending 12 of the 62 Midlands primary schools which had previously completed the QSOE survey (See Chapter 5). All 62 schools were contacted via email to invite them to participate and provided with information about the study. In the event of no response, follow-up telephone calls were made until 12 schools had agreed to participate. Children were eligible for inclusion if their school agreed to participate in the second phase of the study and if they were present on the day of data collection at their school, with parental consent to take part. A voucher for £50 was given to each school that took part for purchasing PA equipment as a thank you for participation.

6.3.2 DATA COLLECTION

6.3.2.1 PHYSICAL ACTIVITY QUESTIONNAIRE (PAQ)

Physical activity was measured using a self-report questionnaire, the PAQ. The PAQ was originally an 80 item measure developed for the 'Pathways Study' which is a school-based obesity prevention programme for American Indian schoolchildren (Thompson et al, 2001). In the Pathways Study, the original PAQ was used as a self-report measure for children to describe the extent to which they took part in a range of physical activities during specified times of the school day. The PAQ used in this study (Appendix 3) was adapted for use in the UK by Glazebrook et al, (2006) and assesses frequency of both sedentary and active activities at three time points in the past 24 hours (before, during and after school).

For the purposes of this study, which focuses on children's PA in schools, the 12 items in the Glazebrook adapted questionnaire measuring sedentary behaviour were removed, leaving 44 items to measure a variety of physical activities. For each item, children were asked to rate the extent to which they engaged in that activity (none, a little, a lot) at three time points during the previous 24 hours (today before school [16 items], yesterday after school [16 items], and yesterday during school[12 items]). Values for each item were 'none = 1,' 'a little = 2' and 'a lot = 3' and were subjective ratings. The PAQ assesses general activity levels and provides an overall PA score without discriminating between specific activity intensities, simply summing scores for each child. In the current study, PAQ score values will be denoted by the phrase 'PA units.'

Through direct observation, researchers in the Pathways study (Thompson et al, 2001) were able to corroborate children's self-assessments on the PAQ, suggesting that it may be a valid measure for comparing children's PA levels. Quirk et al (2018) also found a strong relationship between the PAQ and MVPA measured by accelerometer ($r=0.568$, $p=0.068$, $n=11$). A questionnaire such as this PAQ which only requires children to recall the previous 24 hours is likely to enhance accuracy as studies indicate that 1-day recall and simple measures of routine PA are better correlated with objective measures (De Vries et al, 2004; Sirard and Pate, 2001). The child-friendly, accessible format, using three simple responses, varying size of font and pictures covering a one day recall period are simple strategies likely to facilitate memory of PA behaviours. This is important when using self-report measures with children, particularly those below the age of 10, as their memory for the timing and nature of their PA behaviours is likely to be limited (De Vries et al, 2004; Sirard and Pate, 2001; Trost, 2007).

PAQ items were summed across the whole time period (Before, During and After School) to create a score for 'Total Physical Activity' (TPA) for the previous day (Possible range=44-132 PA units).

6.3.2.2 QUALITY OF SCHOOL OUTDOOR ENVIRONMENT SURVEY (QSOE)

Data regarding attributes of the school outdoor environments were collected from schools prior to PA measurement by means of the QSOE (See Chapter 5). This was developed to capture information about physical, policy and social environmental characteristics of primary schools which may be associated with children's PA in the outdoor environment and consisted of 47 questions for completion by a member of school staff online. The survey was informed by the results of qualitative work involving interviews with adults and children working in UK primary schools and was created specifically for the current study.

A database of variables was created from the QSOE items for use in this study. Binary variables were entered into the database coded as 0 and 1. For example, in relation to the question, 'Does your school participate in the daily mile', the answer 'Yes' was coded as 1 and the answer 'No' was coded as 0. Two 3-way variables were created; When can children use the woodland and When can children use the field and entered into the database with 'not at all' coded as 0, 'only in better months' coded as 1 and 'all year' coded as 2. Responses to QSOE multiple choice questions such as those that required respondents to detail the number of types of fixed/loose equipment at their schools were summed and entered into the database as counts. Likert-type items were entered into the database with numbers representing the degree of agreement with the statement; 1 being the lowest level of agreement. Items for which respondents provided free-text information, such as those requesting explanations for equipment limitation or reasons for policy implementation were not included in this chapter. Variables from the survey were entered into the database forming Level 2 variables for each child at each school. The final list of Level 2 variables is shown in Table 6.1.

6.3.2.3 SOCIOECONOMIC SCHOOL VARIABLES

From the school postcode, the Index of Multiple Deprivation was determined for each school (Ministry of Housing, Communities and Local Government, 2019). This is a measure of relative deprivation at a local level which ranks each small area in England from most to least deprived (1-32,844). Pupil Premium values were also obtained for each school. It is a requirement for schools to publish information about pupil premium so it is available on individual school websites and is reported as the percentage of children at a school who are eligible to receive pupil premium assistance. Pupil Premium funding is provided to support children who are disadvantaged, reflected by their eligibility for free school meals, looked after and previously looked after children and children whose parents are in the armed forces (Education and Skills funding agency, 2020; Foster and Long, 2020).

A mean standard attainment test (SATs) score was obtained for each school by calculating the mean of the combined percentage attainment scores of Reading and Maths for each school reported on their websites in the Summer term prior to data collection the following Autumn. SATs are undertaken by all Year 6 children and are used to assess children's academic progress against age related expectations (Standards and Testing Agency, 2019).

School Outdoor Environment Characteristics			School Characteristics
Physical	**Social**	**Policy**	
Outdoor space is perceived as crowded (1-5)	Number of child roles; Buddies, Sports' AmbassadorsPlay Leaders (1-3)	When can children use woodland? (0=Not at all/1=Only in better months/2=All year)	IMD Rank (score)
Outdoor space is perceived as extensive (1-5)	Number of adult roles; midday supervisors, head teacher, teacher, external provider, TA (1-5)	When is loose equipment available? (1=Always available/0=Only at lunch break)	Pupil Premium (%)
Enough outdoor space is perceived (1-4)	Adults encourage equipment use At break/lunch (1=yes 0=no)	Fixed equipment available in all weather (1=Yes 0=No)	Number on Roll (NOR) (count)
Outdoor space is perceived to be fully utilized (1-4)	Children as sport's ambassadors (1=yes 0=no)	When can children use field? (0=Not at all/1=only in better months /2=all year)	SATs Average (%)
Total number of outdoor spaces (count)	Children as buddies (1=yes 0=no)	Number of types of games played (count)	Location (Urban/Not Urban) (1=urban 0=not urban)
Number of types of playground markings (count)	Children as play leaders (1=yes 0=no)	Are any games/activities Banned? (1=yes 0=no)	
Number of types of loose equipment (count)	Social furniture (1=yes 0=no)	Number of types of activity in playground (count)	
Number of types of fixed equipment (count)		Daily mile (1=yes 0=no)	
School has covered areas (1=yes 0=no)		Number of after school activities (count)	
		Lessons taught outside often (1-4)	
		Training in outdoor learning (1=yes 0=no)	
		Forest schools (1=yes 0=no)	
		Children use playground before school (1=yes 0=no)	
		Children use playground after school (1=yes 0=no)	
		School provides outdoor clothing (1=yes 0=no)	
		Total Number of Active Transport initiatives (count)	
		School runs walk-to-school initiatives (1=yes 0=no)	
		Road safety training (1=yes 0=no)	
		School allows scooters (1=yes 0=no)	
		Health messages in curriculum (1=yes 0=no)	
		Environmental messages in curriculum (1=yes 0=no)	
		Playground rules displayed (1=yes 0=no)	

Table 6.1: Level 2 Variables from QSOE and school characteristics

6.3.2.4 CHILD DEMOGRAPHIC INFORMATION

Children reported their year group and gender.

6.3.2.5 SAMPLE SIZE CALCULATION

Sample size calculation was made using data obtained from a similar PA questionnaire to the PAQ, the PAQ-C, which has been used extensively in North America (Biddle et al, 2011b; Thomas and Upton, 2014) and for which data are readily available. The PAQ-C gives a summary score of children's PA based on 9 items (Kowalski et al, 2004).

Using nQuery V.4.0, it was estimated that to provide 80% power to detect a difference in mean PAQ-C scores of 0.35 between two groups, assuming a standard deviation of 0.7, then 64 children per group would be needed. The mean PAQ-C difference of 0.35 was similar to the mean difference of 0.39 which has previously been considered to 'most likely represent a real difference in PA levels ' (Fairclough et al, 2011) or to discriminate between children who meet and do not meet PA guidelines (McCrorie and Ellaway, 2017). The Standard Deviation estimate of 0.7 was an average of PAQ-C standard deviation values obtained from several International studies (Ahamed et al, 2007; Crocker et al, 1997; Crocker et al, 2000; Kowalski et al, 1997; Muratova et al, 2001; Karppanen et al, 2012). A similar estimate was obtained when only UK studies were considered (Austin et al, 2013; Noonan et al, 2016; Thomas and Upton, 2014; Voss et al, 2013). Assuming that school classes would have, on average, 25 pupils who participate and that each school would have one Year 5 and one Year 6 class, a sample size estimation was calculated which also accounted for the possibility of intra-cluster correlation by using a design effect factor (Figure $6.1_{(i)}$) which was calculated to be 4.92 (where number of children in each cluster, m=25x2=50 and ICC, ρ=0.08).

The Intracluster Correlation Coefficient (ICC), ρ, measures how similar the data are within clusters and is calculated by comparing the variance within clusters with the variance between clusters (Barratt and Kirwan, 2009; Figure $6.1_{(ii)}$). Values of ICC can range from 0-1, with a larger value indicating more homogeneity in responses between individuals in a cluster with a value of 1 meaning that there is no variation between individuals in a cluster so that the sample size is effectively the number of clusters. As the ICC becomes smaller, this indicates more independence of responses from individuals in the cluster with respect to a particular variable. A larger sample size will be needed to detect any significant differences in a particular variable as the ICC increases (Barratt and Kirwan, 2009). The ICC for this estimate was assumed to be 0.08. This is the largest value ICC cited across six individual studies where the PAQ-C was used (Downs et al, 2012; Gray et al, 2016; Naylor et al, 2008; Ogunleye et al, 2011; Phillips et al, 2012; Schaben et al, 2006) and as such is the value assuming the largest clustering effect, thus helping to ensure that the sample size calculation is adequate.

Multiplying the number of children needed in each group (n=64) by the design effect factor (4.92) gave a total of 315 children. When this total number per group was divided by the number of children likely to complete questionnaires at each school (n=50), this gave a figure of 6 schools needed in each group to provide adequate power to detect differences between groups or 12 schools in total for the current study.

Each school represents one cluster so, assuming an average class size of 27 based on DfE statistics (Department for Education, 2016), this would have meant that 54 children from each cluster would participate, assuming that the school had only one Year 5 and one Year 6 class. However, allowing for an opt-out rate of 2 children per class at each school, then cluster size would then be estimated as 50 (25 in each Year 5 and Year 6 class). An opt-out number of 2 per class seemed reasonable based on the study in Chapter 4 where a maximum number of 2 children opted out from any class. This would be a 7% opt-out rate.

(i) ***Design effect factor*** (Barratt and Kirwan, 2009; McCoach and Adelson, 2010)

$$1 + (m-1) \times \rho$$

m=number of children in each cluster (school)

ρ = ICC for the desired outcome

(ii) ***Intracluster Correlation Coefficient-ICC*** (Barratt and Kirwan, 2009)

$$ICC/\rho = \frac{Between\ Cluster\ Variance}{(Between\ Cluster\ Variance + Within\ Cluster\ Variance)}$$

$$\text{ICC}/\rho = \frac{s_b^2}{s_b^2 + s_w^2}$$

Figure 6.1: Equations for calculating Design Effect Factor and Intra-Cluster Correlation

Figure 6.1: Equations for calculating Design Effect

6.3.3 PROCEDURE

Opt-out consent was sought from parents by means of parent/guardian information sheets sent home via class teachers at least one week before data-collection took place accompanied by child-centred information sheets and forms for opting out. Parents completed the opt-out form if they did not want their children to participate in completing the self-reported PA questionnaire. Participating schools were given the options of having questionnaires administered to children by a researcher or a class teacher. Schools opting to administer questionnaires in-house were sent a pack, including PA questionnaires, protocol for administering the questionnaires, administration forms for recording opt-out numbers and a stamped, addressed envelope for return questionnaires.

On the day of data collection, class teachers or researcher administered the PAQ according to a set procedure (Table 6.2) to ensure consistency between schools, which included informing children about their choices and providing alternative activities if they had been opted out by parents or decided not to take part.

6.3.4 ETHICS

The study was given ethical approval by the Faculty of Medicine and Health Sciences Ethics Committee at the University of Nottingham (REF: D200317; Appendix 2). Children were free to withdraw from the study at any point prior to collection of the competed questionnaires. Children are not identifiable by their questionnaires.

Physical Activity Measurement in Schools Study

Adminstration of the Physical Activity Questionnaire: PAQ
Version 2.0: 06/02/2017

Please follow these procedures when administering the PAQ

1. Please provide each child who has parental consent with a questionnaire and ensure that any child whose parents have opted them out of the study does not have a questionnaire.

2. Explain to the children that they are taking part in a research study and that it is entirely their own choice as to whether they complete the questionnaire or not. Even if their parents have given permission for them to take part, they are still free to decide not to.

3. Please explain to any children who are not taking part what work they need to get on with while the other children complete the questionnaire.

4. Before the children start, it is important to emphasize that the questionnaire is **NOT A TEST.** There are no right or wrong answers. The researchers are interested in every child just as they are.

5. Children may be told that the teacher/researcher will be able to read any words for them from the questionnaire and explain what something is. Adults can read aloud each question to the class if preferred.

As children finish the questionnaire, it would be helpful if the teacher/researcher could check that no question has been missed out.

Table 6.2: Procedure for administering the PAQ

6.3.5 DATA ANALYSIS

Data were analysed descriptively using SPSS v 24 (IBM SPSS). In order to ascertain any differences between the sample of 12 schools included in this study and the 56 schools which also responded to the QSOE but did not participate in this phase of the study, the median numbers of items/facilities/policies reported by the 12 schools in the sample were compared with those reported in the 56 schools and Mann Whitney U tests used to detect whether there were any statistically significant differences. Chi Square or Fishers Exact tests were used to detect whether the frequency distribution of categorical or Likert responses was statistically significantly different between the 12 schools in this study and the non-participating 56 schools. The Fishers Exact test was used when the expected frequency was too small in more than one cell (Expected frequency <5). Family-wise error was controlled using the Bonferroni Correction.

6.3.5.1 EXPLORATORY ANALYSIS

An initial exploration of the relationship between TPA and school variables was undertaken. Firstly, for each of the dichotomous or 3-way variables listed in Table 6.1, PA data were divided according to school responses into 2 or 3 groups accordingly. For example, for the dichotomous variable ‘School participates in daily mile,’ children’s TPA scores were placed into 2 groups according to whether their school did or did not participate in the daily mile. As a further example, for the 3-way variable, ‘Use of field,’ children’s TPA scores were placed into 3 groups according to whether their school had no field, whether the field was used only in better months of the year or if the field was used all year. Independent t-tests or 1-way ANOVA were used to estimate whether there were statistically significant differences between the groups. Where variables were ordinal or of a Likert style, Spearman’s rank order correlations were used to examine the relationship between PA and those variables. This exploration was also undertaken for relationships between During school PA, Before school PA and After school PA and school characteristic variables.

6.3.5.2 MULTI-LEVEL LINEAR REGRESSION MODEL

To account for the two-level hierarchical structure of the data, which has individual responses from students at Level 1 nested within schools at Level 2, a multi-level linear regression model was developed in STATA v 15 (STATA Corp LLC US). This takes account of homogeneity within schools and heterogeneity between schools. Children at any one school are more likely to be similar to each other on variables such as PA due to each school having a unique mix of policies, facilities and communities and so children’s PA data are therefore more likely to be correlated if they study at the same school and this is accounted for in a multi-level model (McCoach and Adelson, 2010).

Whilst in a general linear model, it is assumed that the model parameters (intercept and regression coefficients) are fixed and can be used to predict values of the dependent variable across the whole sample (Field and Wright, 2011), in a multilevel model, these parameters are thought of as being random and able to vary across contexts. In the current study, this means that instead of assuming that the effects of school environmental features were equal across schools, it was assumed that the effects of these features might vary from school to school. These random effects can be introduced into the model through random intercepts and random slopes (Field and Wright, 2011).

6.3.5.3 INITIAL NULL MODEL

Firstly, a simple variance component (random intercepts) model was fitted using the 'mixed' command in STATA to determine whether there was significant variability in children's TPA across the 12 schools. Where there were no differences between schools in the Level 2 variables or where only one school differed, these Level 2 variables were not included in the multi-level model.

In this 'empty' or 'null' model, the average TPA of the entire data-set is calculated as well as the variance of school averages around it and the variance of the child participant scores around the average scores of their schools. The null model allows for school clustering effects on PA with no explanatory variables. The total variance of the dependent variable is estimated and broken down into within (Level 1) and between (Level 2) school variance. The null model can be represented by the equation in Figure 6.2 $_{(ii).}$

6.3.5.4 TESTING FOR SCHOOL EFFECTS

To test the significance of school effects, a likelihood ratio test comparing the null multi-level model with the null single-level model was carried out for TPA. The null single level model can be represented by the equation shown in figure 6.2 $_{(i).}$ It includes only the random effects at level 1 and not those at school level. The likelihood ratio test statistic can then be calculated (see Figure 6.3), which is the difference between the results for the null single level and null multi-level models. The significance of the likelihood ratio test statistic was tested by comparing it to a χ^2 distribution with degrees of freedom determined by calculating the difference between the number of parameters in the null single level model and the number of parameters in the null multi-level model (West et al, 2007). The significance level was set at 0.05.

(i) ***Null single level model*** $y_{ij}=\beta_0+e_{ij}$

(ii) ***Null multilevel model*** $y_{ij} = \beta_0 + u_{0j} + e_{ij}$

(iii) ***Random intercept model with one explanatory variable***

$$y_{ij}=\beta_0+\beta_1 x_{1ij}+u_{0j}+e_{ij}$$

e.g.: $\text{Total Physical Activity}_{ij}=\beta 0+\beta_1\text{School Year}_{ij}+u_{0j}+e_{ij}$

$\boldsymbol{\beta_0}$ = *average physical activity score of all child participants across schools*

$\boldsymbol{\beta_1 x_{1ij}}$ = *a coefficient giving the numerical relationship between one explanatory variable x_1 and the physical activity score, y*

$\boldsymbol{u_{0j}}$=*random effect at the school level; the difference between the overall average of the data and the average score of each school (Level 2 residuals)*

e_{ij}=*random effect at the individual level; the difference between each child participant's physical activity score and the average physical activity of the school where the child is educated (Level 1 residuals)*

Figure 6.2: Equations for calculating single level and multilevel models

Likelihood ratio test statistic LR = -2 log L_1 – (-2 log L_2)

2x (Difference in log-likelihood Values)

log=natural logarithm

Figure 6.3: Method for calculating likelihood ratio test statistic

School effects were explored by examining school level residuals. These, together with associated standard errors were estimated and ranked in STATA. Caterpillar plots were created to show the school effects in rank order together with 95% confidence intervals. The residuals show how schools differ from the overall mean. A school differs significantly from the average at the 5% level if its confidence interval does not overlap the line at zero (representing the mean TPA score across all schools).

6.3.5.5 RANDOM INTERCEPT MODEL: ADDING INDIVIDUAL LEVEL VARIABLES

Relationships between the student level variable *School Year* and TPA were explored in a random intercept model. The model equation is shown in Figure 6.2 $_{(iii)}$. Age, in this model is defined as being a fixed effect on PA: ie, it has the same effect no matter which school a child attends. School residual values for the model were calculated and regression lines for each school. A further random intercept model was used to explore relationships between TPA and Gender.

6.3.5.6 RANDOM INTERCEPT AND RANDOM SLOPE MODEL: ADDING SCHOOL LEVEL VARIABLES

The unadjusted univariate relationships between TPA and each school level explanatory variable were then calculated firstly assuming random intercepts alone, which assumes that the effect of each variable is the same for all schools; ie the slope of each regression line is constant, and then subsequently assuming random intercepts and slopes where the assumption is made that the effect of the explanatory variables can differ across schools, permitting a different slope for each school. The fit of the random intercept/random slope models was compared using likelihood ratio tests.

6.3.5.7 MISSING DATA PROCEDURE

If continuous school level data items were found to be missing, the procedure would be to impute the missing values. For missing categorical data items (where imputation is not possible), the models were run, initially, without that school. If the variable was determined to be statistically significant, the school's data was omitted from the final analysis (as STATA does not include cases which have any missing data). If the variable was not found to be statistically significant, the analysis was undertaken with all schools included so as to utilise information across the whole dataset.

6.3.5.8 STEPWISE PROCEDURE

Variables that showed relationships with children's TPA which were statistically significant or approaching statistical significance ($p < 0.1$) were then entered into a multi-variable, multi-level model and a stepwise procedure was used to develop a final model of statistically significant variables at the $P<0.05$ level. At each step, the variable with the largest p-value was removed until the final model of variables significant at $p<0.05$ was reached. At this point, each potential explanatory variable not included in the final model was re-introduced in turn to check whether there was an improvement in model fit.

6.3.5.9 CHECKING MODEL ASSUMPTIONS

Casson and Farmer (2014) describe the assumptions that need to be met for Linear Regression calculations. These assumptions were considered with relation to the data in the current study.

1. *There is reason to believe that the explanatory variable influences the dependent variable.*

Explanatory variables in this study were selected on the basis that they have been reported previously to be associated with PA in the literature or that members of school communities, both adults and children, have perceived them to be important with relation to children's PA.

2. *The outcome variable is assumed to be continuous.*

The TPA score was assumed to be a quantity on a continuous scale of measurement. Whilst the PAQ only assesses the level of PA along a scale of whole numbers representing the amount of activity, it was assumed that a child could do a fraction more or less than the amount they reported. The continuity of the data was only limited by the accuracy of the measurement.

3. *The outcome variable and the explanatory variables are related in a linear way.*

There must be a linear relationship between the outcome variable and the independent variables. This was checked first by plotting the dependent variable against each of the explanatory variables from the final model. A further check was then made by examining the residual vs predicted value plots. For the assumption of linearity to hold, the residuals should show no clear pattern.

4. *The residuals are assumed to be normally distributed.*

This assumption was checked firstly by examining a histogram of the residuals. Subsequently, a normal quantile plot, a normal probability plot and a kernel density plot were examined. There is some debate about whether these tests are necessary. Schmidt and Finan (2018), for example, argue that for large samples, linear regression models stand up well to violations of the normality assumption. Gelman and Hill (2007, p. 46), too, state that parameter estimates in a multilevel model are not affected by normality of the residuals.

The models in the current study have sample sizes which adhere to the guideline of 10 data points per explanatory variable (Casson and Farmer 2014). The model was estimated using STATA's default ML estimation procedure. This procedure operates well as sample sizes increase and perhaps not as efficiently with smaller sample sizes, especially if the Level 2 sample is smaller as in this study (McNeish and Stapleton, 2016). Maas and Hox (2004) advise that regression coefficients are estimated without bias although their standard errors are biased downward with small cluster sizes. With ML estimation, it is likely that error estimates will be slightly too small if the number of clusters is less than 50 (Ringdal, European Social Survey). When measuring variance components, Ringdal advises that estimates of Level 1 residual errors are accurate. For Level 2, estimates, in groups of 100 and over, are also accurate. Once the group size goes down to 30, level 2 variances will still be estimated satisfactorily although a cluster size of 10 will lead to variances being underestimated.

5. *There is an assumption that the variance in the residuals is the same across all levels of the explanatory variables: the assumption of homoscedasticity.*

This assumption was checked by looking again at the scatter-plot showing predicted values against the residuals. A random pattern indicates constant variance.

6.4 RESULTS

6.4.1 QSOE

Comparisons of QSOE responses for School Characteristic variables between the 12 schools in this study and the other 56 schools that responded are shown below (Table 6.3), tested against a Bonferroni-adjusted alpha level of 0.016 (0.05/3). It can be seen that the percentage of children eligible for pupil premium was reported to be nearly double in participating schools (p=0.021) although this was not a significant difference. There was no significant difference in area deprivation as indicated by the rank of the IMD scores (p=0.431), which fall in the 4th and 5th deciles of IMD ranks (4th being more deprived; Ministry of Housing, Communities and Local Government, 2019) or in the Number on Roll (p=0.351). In terms of the QSOE PA indices, no statistically significant differences were found between the sample of 12 schools in this study compared with the 56 schools that did not participate.

School Characteristics	Participating Schools (n=12) Median (Range)	Non-participating Schools (n=56) Median (Range)	P Value
Pupil Premium (% pupils on roll)	33.50 (8-46)	18.00 (0-54)	0.021
Area Deprivation Rank	11983 (1557-30180)	15138 (687-32802)	0.431
Number on Roll	320.50 (55-650)	250 (28-720)	0.351

Table 6.3 : Comparison of median values of school characteristic explanatory variables between 12 schools participating in the PA measurement study and 56 non-participating schools that also completed the QSOE

6.4.2 PARTICIPANTS

Nine hundred and ninety-one out of 1016 invited primary school children (97.5% response rate) from 12 Midlands schools (Anonymised to A-L) completed a PAQ. Of these, 466 were in Year 5 and 525 in Year 6 . Nine hundred and twenty-six children provided information about gender; 467 boys and 459 girls. At one school (L), 55 children did not report gender and at 2 schools (D, F), 4 children did not state their gender. This information is summarised in Table 6.4.

School	n Total	n (%) Year 5	n (%) Year 6	n (%)Boys	n (%)Girls	n opted out Year 6	n opted out Year 5
A	163	78 (48)	85 (52)	84 (52)	78 (48)	0	4
B	73	25 (34)	48 (66)	32 (44)	41 (56)	0	0
C	46	20 (43)	26 (57)	21 (46)	25 (54)	0	2
D	107	58 (54)	49 (46)	53 (53)	50 (47)	2	0
E	79	37 (47)	42 (53)	38 (48)	41 (52)	1	2
F	132	61 (46)	71 (54)	72 (56)	56 (44)	0	0
G	50	26 (52)	24 (48)	35 (70)	15 (30)	2	1
H	98	49 (50)	49 (50)	40 (41)	58 (59)	2	2
I	88	34 (39)	54 (61)	38 (43)	50 (57)	2	1
J	85	43 (51)	42 (49)	46 (54)	38 (46)	2	2
K	13	8 (62)	5 (38)	7 (54)	6 (46)	0	0
L	57	27 (47)	30 (53)	1 reported	1 reported	0	0
Total	991	466 (47)	524 (53)	466 (50)	459 (50)	11	14

Table 6.4: Numbers (Percentage) of children taking part at each of the 12 schools

6.4.3 PHYSICAL ACTIVITY DATA

Mean values of TPA (Overall Mean: 70 PA units) were calculated for each school (Figure 6.4i) and ranged from 65 PA units to 75 PA units. A difference of 10 points in the PAQ equates to 3 to 5 extra physical activities per day. Mean values for During, Before and After School PA were also calculated for each school and are shown in Figure 6.4 (ii, iii, iv).

School	Mean TPA (PA units)	Standard deviation	n	Min (PA units)	Max (PA units)
L	65.2	10.91	57	45	102
K	65.9	8.38	13	54	79
J	66.4	12.37	85	44	98
I	66.9	9.29	88	48	93
H	68.2	12.32	98	48	107
G	68.8	10.91	50	49	95
F	69.0	12.75	132	44	101
E	70.8	11.89	79	48	101
D	70.9	12.18	107	50	106
C	72.0	9.94	46	47	93
B	73.0	14.58	73	47	109
A	75.3	13.91	163	48	120
Total	70.0	12.59	991	44	120

(i)

School	Mean During School PA (PA units)	Standard deviation	n	Min (PA units)	Max (PA units)
L	20.0	3.46	57	13	29
K	21.7	3.30	13	18	31
J	19.6	3.97	85	12	29
I	19.4	2.93	88	12	26
H	19.7	3.64	98	13	32
G	19.6	3.12	50	12	27
F	19.5	3.71	132	12	30
E	21.2	3.30	79	14	29
D	19.4	3.61	107	12	29
C	21.0	3.62	46	13	29
B	20.9	4.36	73	14	30
A	21.3	3.93	163	12	33
Total	20.2	3.73	991	12	33

(ii)

School	Mean Before School PA (PA units)	Standard deviation	n	Min (PA units)	Max (PA units)
L	21.5	4.58	57	16	36
K	19.8	2.88	13	16	24
J	22.4	4.68	85	16	38
I	23.3	4.22	88	17	39
H	23.4	5.28	98	16	36
G	23.4	4.32	50	18	36
F	24.7	5.89	132	16	39
E	23.4	5.19	79	16	37
D	24.5	5.13	107	17	41
C	25.0	4.67	46	17	37
B	24.8	6.13	73	16	40
A	26.1	6.16	163	17	42
Total	24.05	5.44	991	16	42

(iii)

School	Mean After School PA (PA units)	Standard deviation	n	Min (PA units)	Max (PA units)
L	23.8	4.73	57	16	38
K	24.4	4.66	13	17	31
J	24.4	5.27	85	16	39
I	24.1	4.33	88	16	37
H	25.1	5.16	98	16	42
G	25.8	5.07	50	17	39
F	24.8	5.07	132	16	40
E	26.3	5.19	79	16	41
D	27.0	5.59	107	16	42
C	25.5	4.60	46	17	37
B	27.4	6.32	73	16	44
A	27.9	5.46	163	17	45
Total	25.8	5.38	991	16	45

(iv)

Figure 6.4

Mean values of PA for each school

(i) TPA
(ii) During school PA
(iii) Before school PA
(iv) After school PA

Mean values of TPA for boys and girls at each school are shown in Table 6.5. The overall mean for boys was 70.9 (SD=12.97) PA units and for girls, 69.6 (SD=12.20) PA units. There was considerable variation in the difference in PA levels between boys and girls between the schools but not in total.

Gender	School	Mean PA Units (Standard Deviation)		n	Min (PA units)	Max (PA units)	Gender	Mean PA Units (Standard Deviation)		n	Min (PA units)	Max (PA units)
Male	J	65.2	(11.64)	46	44	94	Female	67.87	(13.37)	38	46	98
	D	71.6	(11.09)	53	50	99		69.94	(12.89)	50	50	106
	L	Unknown						Unknown				
	A	76.9	(13.81)	83	48	103		73.74	(13.86)	78	50	120
	E	67.3	(10.47)	38	48	89		73.98	(12.34)	41	49	101
	I	66.3	(10.54)	38	51	93		67.34	(8.29)	50	48	90
	K	67.4	(8.30)	7	54	79		64.17	(8.89)	6	54	77
	B	76.0	(14.54)	32	54	100		70.90	(14.40)	41	47	106
	F	70.1	(12.69)	72	44	99		66.86	(12.05)	56	49	95
	G	69.3	(11.63)	35	49	95		67.60	(9.30)	15	56	90
	C	71.2	(11.48)	21	47	89		71.76	(8.68)	25	56	93
	H	71.8	(14.95)	40	48	107		65.74	(9.51)	58	48	97
	Total	70.9	(12.97)	466	44	109		69.58	(12.21)	459	46	120

Table 6.5: TPA at each school by gender

6.4.3.1 EXPLORATORY ANALYSIS

In Table 6.6, mean values of TPA for each School characteristic/QSOE item category group (dichotomous using t-tests; 3-way variables using a 1-way ANOVA) and Spearman’s Rank Order correlations between ordinal/Likert variables are shown. Mean values of During school PA, Before school PA and After school PA for each School characteristic and Spearman’s Rank Order correlations between PA at different points in the day and school location are shown in Table 6.7.

School Characteristics: From these results, it can be seen that children at schools in less deprived areas, with higher numbers of children on roll, in urban areas and with higher SATS results were more active across the whole day. Children’s During school PA was not associated with area deprivation or the school’s number on roll. Where school pupil premium levels were higher, children at those schools were less active during the school day.

Variable	TPA Mean	TPA SD	n	Spearman's Rank Order r_s	P value
School Characteristics					
Area deprivation				0.103	**0.001**
Pupil premium				-0.048	0.133
Number on roll				0.091	**0.004**
SATS average				0.112	**0.001**
Urban Not urban (suburban and rural)	72.8 68.2	13.86 11.68	393 598		**0.001**
Physical					
Outdoor space is perceived as crowded				-0.083	**0.009**
Outdoor space is perceived as extensive				0.145	**0.001**
Enough outdoor space is perceived				0.092	**0.004**
Outdoor space perceived to be fully utilized				-0.062	**0.005**
Outdoor spaces (n)				-0.032	0.319
Types of playground markings (n)				-0.013	0.692
Types of loose equipment (n)				0.054	0.090
Types of fixed equipment (n)				0.166	**0.001**
Covered Spaces No Covered Spaces Yes	68.9 70.0	12.81 12.41	373 618		**0.028**
Social					
Child roles (n)				-0.06	**0.048**
Adult roles (n)				-0.041	0.197
Adults encourage at break No Adults encourage at break Yes	71.5 68.6	12.59 13.46	487 504		**0.001**
Adults encourage at lunch No Adults encourage at lunch Yes	69.1 72.2	13.37 12.12	692 299		**0.001**
Children act as sports' ambassadors No Children act as sports' ambassadors Yes	67.8 71.3	11.64 12.93	355 636		**0.001**
Children act as buddies No Chldren act as buddies Yes	70.1 70.0	12.71 12.46	513 478		0.864
Children act as play Leaders No Children act as play Leaders Yes	72.0 68.7	13.49 11.77	397 594		**0.001**
No social furniture School has social furniture	70.8 69.4	12.64 12.52	430 561		0.089

Variable	TPA Mean	TPA SD	n	Spearman's Rank Order r_s	P value
Policy					
No Woodland Woodland used in better months Woodland used all year	68.2 68.5 71.4	11.43 11.77 13.19	293 136 562		**0.001**
Loose equipment only available at lunch Loose equipment always available	70.8 68.7	13.19 11.33	635 356		0.008
Fixed equipment in all weather No Fixed equipment in all weather Yes	69.4 70.5	12.55 12.73	340 601		0.178
No field Field used in better months Field used all year	70.1 68.4 71.7	11.54 12.04 13.11	92 447 452		**0.001**
Types of games played (n)				-0.038	0.238
Some activities banned No activities banned	70.1 70.0	12.63 12.56	428 563		0.880
Types of activities played (n)				0.017	0.599
School participates in daily mile No School participates in daily mile Yes	70.7 68.0	12.70 12.02	752 239		**0.005**
After school activities (n)				-0.029	0.359
Lessons taught outside often				0.014	0.655
Recent training in outdoor learning No Recent training in outdoor learning Yes	71.7 68.2	13.15 11.66	524 467		**0.001**
Forest schools No Forest schools Yes	71.8 69.2	12.44 12.55	403 503		**0.002**
Play in grounds before school No Play in grounds before school Yes	68.7 70.8	11.33 13.19	356 635		0.008
Play in grounds after school No Play in grounds after school Yes	69.1 72.5	12.22 13.25	725 266		**0.001**
School provides outdoor clothing No School provides outdoor clothing Yes	71.1 68.7	12.70 12.30	569 422		**0.003**
Active transport initiatives (n)				-0.004	0.888
Walk to school initiatives No Walk to school initiatives Yes	68.0 70.8	12.16 12.67	280 711		**0.001**
Road safety training No Road safety training Yes	70.0 70.0	12.97 12.34	393 598		0.991
School allows scooters No School allows scooters Yes	70.7 69.7	12.71 12.51	358 633		0.205
Health messages in the curriculum No Health messages in the curriculum Yes	68.00 70.8	12.01 12.71	262 729		**0.002**
Environmental Messages No Environmental Messages Yes	70.3 69.6	13.03 11.90	594 397		0.413
Rules Displayed No Rules displayed Yes	71.7 68.1	13.12 11.67	529 462		0.001

Table 6.6: Mean values of TPA for dichotomous (or 3 way) explanatory variables and Spearman's rank order correlations between TPA and ordinal or Likert-Style variables

Physical: Children were more active across the whole day where space in the school was reported to be more extensive, uncrowded, sufficient and not fully used, where covered spaces were provided for outdoor learning and where their school had more pieces of fixed equipment.

Social: TPA was higher at schools where adults encouraged active behaviours at break times and where children were trained in the roles of 'Sports' Ambassador' and lower where schools had 'Play Leaders'.

Policy: Children were more physically active at schools where they were allowed to play in the school grounds before and after school, where they could use their woodland area and field throughout the year and where outdoor clothing was provided. Where there were more walk-to-school initiatives and health messages in the curriculum about active transport, children were correspondingly more active. Children were less active at schools which had equipment available at all break times rather than at lunch time only, where playground rules were displayed clearly and where the staff had received recent training in outdoor learning.

Variable		**Mean**	**SD**	**n**	**Spearman's Rank Order r_s**	**P value**
Area deprivation	TPA				-0.103	**0.001**
	During School PA				-0.046	0.148
	Before School PA				-0.082	**0.010**
	After School PA				-0.132	**0.001**
Pupil premium	TPA				-0.048	0.133
	During School PA				-0.062	**0.050**
	Before School PA				-0.007	0.825
	After School PA				-0.063	**0.048**
Number on roll	TPA				0.091	**0.004**
	During School PA				0.012	0.717
	Before School PA				0.085	**0.007**
	After School PA				0.126	**0.001**
SATS average	TPA				0.112	**0.001**
	During School PA				0.094	**0.003**
	Before School PA				0.076	**0.017**
	After School PA				0.135	**0.001**
Urban	TPA	72.8	13.86	393		**0.001**
Not urban		68.2	11.68	598		
	During School PA	20.5	3.92			**0.035**
		20.0	3.58			
	Before School PA	25.1	5.74			**0.001**
		23.4	5.14			
	After School PA	27.3	5.64			**0.001**
		24.8	4.98			

Table 6.7: Mean values of PA at different points in the day for dichotomous (or 3 way) School Characteristic variables and Spearman's rank order correlations between PA and ordinal or Likert-Style variables

6.4.3.2 NULL MODEL: TOTAL PHYSICAL ACTIVITY

Model estimates are shown in Table 6.8. The overall mean TPA score across all 12 schools was 69.6 PA units. The between-school (level 2) variance in PA was 6.7 and the within-school variance (between students Level 1) was 150.5. The total variance in the TPA score data was therefore 6.7+150.5=157.2.

The variance partition coefficient (VPC) was 6.7/157.2 = 0.04, which indicated that 4% of the variance in PA could be attributed to differences between schools (similarly that 96% was due to individual level differences). A likelihood ratio test comparing the null multilevel model with the null single-level model was calculated to be 32.28 (p<0.05; See figure 6.3) with one degree of freedom, showing the multilevel model to be the better fit to the data.

TPA Model	**Coefficient**	**95% Confidence Interval**	**p**	**Between School Variance Component**	**95% Confidence Interval**	**Within School Variance Component**	**95% Confidence Interval**	**Log Likelihood**	**VPC**	**Total Variance**
Null Single Level	70.03	69.25 70.82	0.001	_____	____	158.23	144.89 172.79	-3915.392	____	158.23
Null Multilevel	69.55	67.85 71.24	0.001	6.72	2.4 18.6	150.46	137.71 164.39	-3899.254	0.04	157.18

Table 6.8: Null multilevel model and null single level model estimates for TPA Data

6.4.3.3 NULL MODEL: SCHOOL EFFECTS

The school level residuals and associated standard errors and rank are shown in Table 6.9. From these values, it can be seen, for example that School L had an estimated residual of -3.09 which resulted from the lowest mean value for TPA. For this school, an estimated mean score of 69.55-3.09=66.46 PA Units for TPA could be calculated. Contrasting with this is school A which had an estimated residual of 5.03 resulting in an estimated mean TPA value of 69.55 + 5.03=74.58 PA Units.

The caterpillar plot for TPA (Figure 6.5) showed that two schools, L and J, on the left hand side of the plot had TPA which was lower than average. At the right hand side, schools B and A had significantly above-average TPA scores.

School	School Effects (u_0)	Standard Error (u_0se)	School Effects Rank (u_0rank)
L	-3.09	1.38	1
J	-2.47	1.18	2
I	-2.10	1.17	3
K	-1.33	2.06	4
H	-1.09	1.12	5
G	-0.54	1.44	6
F	-0.51	0.99	7
E	0.95	1.22	8
D	1.09	1.08	9
C	1.33	1.48	10
B	2.74	1.26	11
A	5.03	0.90	12

Table 6.9: TPA school residuals: Null model

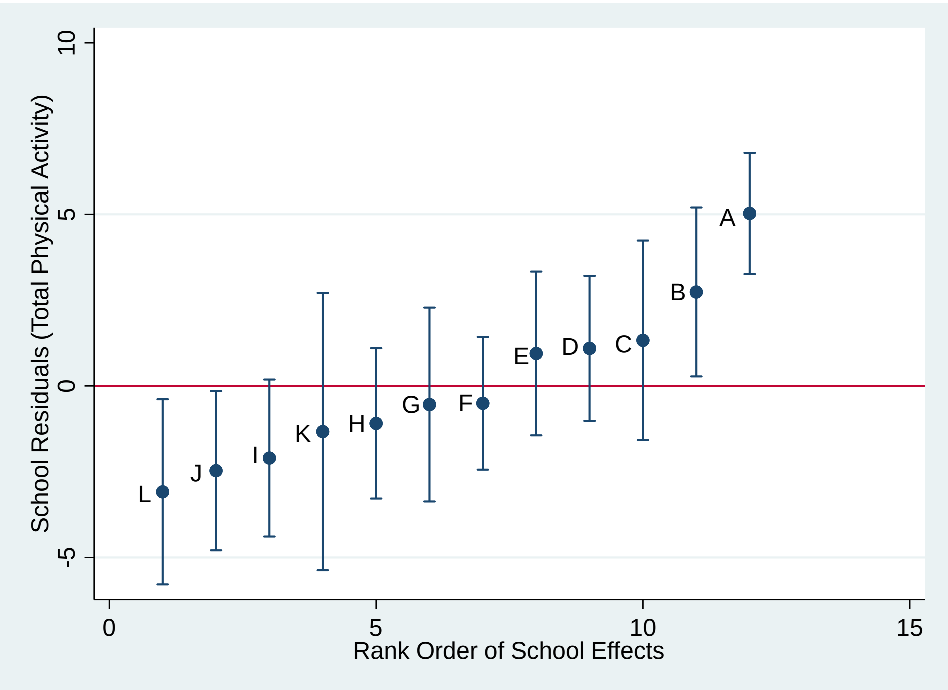


Figure 6.5: Caterpillar plot showing school residuals and associated error bars in rank order for TPA: Null Model

6.4.3.4 RANDOM INTERCEPT FIXED SLOPE MODELS: ADDING INDIVIDUAL LEVEL VARIABLES

Two random intercept models were used to explore the relationships between each of the student level variables (*School Year*; *Gender*) and TPA.

Total Physical Activity by School Year

When School Year was added into the Null model, the effect coefficient for School Year showed that individuals in Year 6 scored on average 4.5 PA units less than children in Year 5 (p=0.001; Table 6.10). Including School Year as an explanatory variable resulted in a model in which the total variance was reduced. The total variance in the model including School Year was 152.54 (7.15 + 145.39), thus an improvement on the null model (where total variance was 157.18).

Explanatory Variable	Coefficient	95% Confidence Interval	p	Between School Variance Component	95% Confidence Interval	Within School Variance Component	95% Confidence Interval	Log Likelihood	VPC	Total Variance
School Year 5/6 Ref: Year 5	-4.47	-5.98 -2.96	**0.001**	7.15	2.60 19.68	145.39	133.07 158.86	-3882.728	0.05	152.54

Table 6.10: Multilevel model estimates for TPA with one explanatory variable: School year

School residual values for the model for TPA with School Year as the explanatory variable are shown in Table 6.11 and a caterpillar plot of these residuals in Figure 6.6. After entering School Year into the model, the same schools (L, J) had Total PA which was lower than average and schools B and A had significantly above-average Total PA scores. Schools D and E had changed places in the ranking.

School	School Effects (u_0)	Standard Error (u_0se)	School Effects Rank (u_0rank)
L	-3.17	1.37	1
J	-2.63	1.17	2
I	-1.82	1.16	3
K	-1.66	2.09	4
H	-1.21	1.11	5
G	-0.70	1.44	6
F	-0.47	0.98	7
D	0.86	1.07	8
E	0.99	1.21	9
C	1.49	1.48	10
B	3.26	1.25	11
A	5.07	0.89	12

Table 6.11: TPA school residuals with one explanatory variable: School year

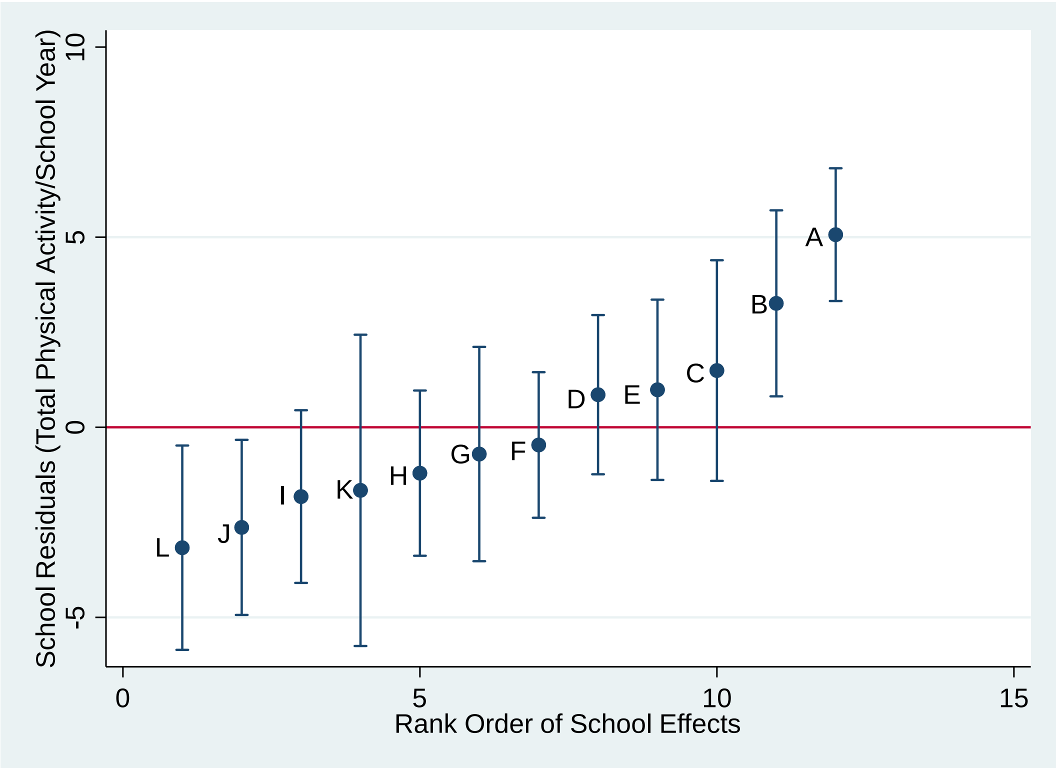


Figure 6.6: Caterpillar plot for random intercept model (TPA) with individual level explanatory variable: School year

Total Physical Activity by Gender

When gender was entered as a Level 1 explanatory variable, girls, on average, were estimated to score 1.4 PA units less on TPA than boys (Table 6.12). This was not statistically significant ($p=0.096$). Total variance was greater in this model of TPA by Gender than in the empty model. The total variance in the model including Gender was 157.80 (6.47+151.33). This residual variance with Gender as the explanatory variable was more than the residual variance of 157.18 in the Null model so entering Gender as an explanatory variable did not enable a better prediction of TPA to be made.

Explanatory Variable	Coefficient	95% Confidence Interval	p	Between School Variance Component	95%Confidence Interval	Within School Variance Component	95% Confidence Interval	Log Likelihood	VPC	Total Variance
Gender Ref: Boys	-1.35	-2.95 0.24	0.096	6.47	2.14 19.60	151.33	138.11 165.82	-3661.683	0.041	157.80

Table 6.12: Multilevel model estimates for TPA with one explanatory variable: Gender

6.4.3.5 RANDOM INTERCEPT MODEL: ADDING SCHOOL LEVEL VARIABLES

Table 6.13 (Left hand side) shows the output from the random intercept fixed slope models when school level variables were entered into the model in turn. It can be seen that a number of univariate associations were found with TPA.

School Characteristics: Significant positive associations were found between TPA and Number on Roll (p<0.015) and SATS average (p=0.012). TPA was increased by 1 PA unit for every 100 additional pupils at a school and by 1.6 PA units for every 10% increase in a school's SATs average. Significant negative associations were seen between TPA and a school's location being urban or not urban (p=0.001). Where a school was not urban, Total PA was 4.2 PA units less than at urban schools

Physical: On all QSOE questions involving perceptions of school outdoor space, schools agreed more strongly that children were more active where space was perceived to be more extensive, sufficient, less crowded and less heavily used. However, only where space was perceived to be extensive was this a statistically significant association (p=0.012). Significant positive associations were also found between TPA and the number of types of fixed equipment (p=0.001). For every additional type of fixed equipment at a school, TPA was increased by 0.8 PA units.

Social: At schools which trained children to be sports' ambassadors, children's PA was nearly 3 PA units higher than children at schools which did not train childen in that role (p=0.073).

Policy: Other positive associations were seen where schools used their woodland consistently across the year and where they provided health messages in the curriculum about the value of active transport. However, these relationships with TPA were not statistically significant. Significant negative associations were seen between TPA and training in outdoor learning (p=0.031). Where staff had received recent training in outdoor learning, TPA was 3.2 PA units lower than at schools which did not have that training (p=0.031). Similarly, a negative association with TPA could be seen where schools displayed their rules (p=0.061).

6.4.3.6 RANDOM INTERCEPT AND RANDOM SLOPE MODEL

Allowing random slopes and random intercepts, univariate associations between school and individual level variables and the outcome variable were explored. These associations were then compared with the random intercept only model using likelihood ratio tests to determine which model was a better fit. Table 6.13 shows the results of the univariate random slope models and likelihood ratio tests comparing the random intercept and random slope models. The likelihood ratio tests showed no statistically significant differences between the two models and so random intercept, fixed slope modelling was chosen as the method for further exploration.

	Random Intercept Model			Random Intercept/Random Slope Model			Comparison of Random Intercept Model with Random Slope Model
Explanatory Variable	**Coefficient (Random Intercept Model)**	**P<0.05**	**95% Confidence Interval**	**Coefficient (Random Slope Model)**	**P<0.05**	**95% Confidence Interval**	**Likelihood Ratio test P<0.05**
Individual							
Year5/Year6	-4.48	**0.001**	-5.99 -2.96	-4.47	**0.000**	-5.98 -2.96	1.000
Male/Female	-1.36	**0.096**	-2.95 0.24	-1.35	**0.096**	-2.95 0.24	1.000
School characteristics							
Area deprivation rank	-0.00	0.719	-0.00 0.00	-0.00	0.719	-0.00 0.00	1.000
Pupil premium	-0.06	0.401	-0.21 0.08	-0.05	0.438	-0.18 0.08	0.449
Number on roll	0.01	**0.015**	0.00 0.02	0.01	**0.015**	0.00 0.02	1.000
SATS average	0.16	**0.012**	0.04 0.28	0.16	0.009	0.04 0 .28	1.000
Urban/Not urban	-4.19	**0.001**	-6.74 -1.64	-4.19	**0.001**	-6.74 -1.64	1.000
Physical							
Outdoor space perceived as crowded	-0.74	0.217	-1.92 0.44	-0.74	0.217	-1.92 0.44	1.000
Outdoor space perceived as crowded 1 2 3 5	------------ -3.07 -4.70 -4.59	Prob> chi^2 = 0.466					
Outdoor space perceived as extensive	1.02	**0.069**	-0.08 2.12	0.69	0.173	-0.30 1.69	0.449
Outdoor space perceived as extensive 1 2 3 4 5	------------ -0.57 0.55 1.11 4.55	Prob> chi^2 = 0.140					
Outdoor space perceived as sufficient	1.145	0.123	-0.31 2.60	1.145	0.123	-0.31 2.60	1.000
Outdoor space perceived as sufficient 1 2 3 4	------------ -0.95 2.32 2.72	Prob> chi^2 = 0.360					
Outdoor space perceived as fully utilised	-0.82	0.297	-2.37 0.72	-0.82	0.297	-2.37 0.72	1.000
Outdoor space perceived as fully utilised 1 2 3 4	------------ 2.86 1.97 -1.25	Prob> chi^2 = 0.210					
Outdoor spaces (n)	0.03	0.894	-0.41 0 .47	0.03	0.894	-0.41 0 .47	1.000

Types of markings (n)	0.24	0.714	-1.04 1.52	0.41	0.370	-0.52 1.34	0.498
Types of loose equipment (n)	0.15	0.341	-0.15 0.45	0.23	**0.087**	-0.03 0.49	0.230
Types of fixed equipment (n)	0.77	**0.001**	0.34 1.21	0.77	**0.001**	0.34 1.20	1.000
Covered learning spaces	1.53	0.376	-1.86 4.92	1.48	0.374	-1.78 4.75	0.749
Social							
Child roles (n)	-0.26	0.828	-2.61 2.09	-0.26	0.828	-2.61 2.09	1.000
Adult roles (n)	-0.32	0.586	-1.46 0.83	-0.32	0.586	-1.46 0.83	1.000
Adults encourage use of equipment at break	-2.33	0.143	-5.46 0.79	-2.33	0.143	-5.46 0.79	1.000
Adults encourage use of equipment at lunch	-1.68	0.371	-5.36 2.00	-1.68	0.371	-5.36 2.00	1.000
Children as sports' ambassadors	2.84	**0.073**	-0.27 5.94	2.67	**0.039**	0.13 5.22	**0.062**
Children as buddies	1.28	0.458	-2.09 4.65	1.28	0.458	-2.09 4.65	1.000
Children as play leaders	-2.34	0.142	-5.47 0.79	-2.34	0.142	-5.47 0.79	1.000
No social furniture/1 piece/2 pieces	0.03	0.979	-2.08 2.13	0.03	0.979	-2.08 2.13	1.000
No social furniture 1Piece 2 Pieces	-------------- 2.04 2.16	Prob> chi^2 = 0.984					
Policy							
When woodland used	1.65	**0.056**	-0.04 3.35	1.57	**0.059**	-0.06 3.19	0.614
School has no woodland Used in better months Woodland used all year	-------------- 0.28 3.19	Prob> chi^2 = 0.160					
Loose equipment always available/only at Lunch	-1.86	0.275	-5.20 1.48	-1.86	0.275	-5.20 1.48	1.000
Fixed equipment available in all weather	0.37	0.842	-3.29 4.03	0.37	0.844	-3.28 4.02	1.000
When field used	1.40	0.265	-1.06 3.86	1.34	1.288	-1.13 3.80	0.913
School has no field Used in better months Field used all year	________ -0.82 1.81	Prob> chi^2 = 0.327					
Types of Games (n)	-0.05	0.792	-0.45 0.34	-0.05	0.792	-0.45 0.34	1.000
Activities Banned/Not Banned	1.54	0.371	-1.83 4.91	1.54	0.371	-1.83 4.91	1.000
Types of Activities (n)	-0.07	0.647	-0.38 0 .23	-0.07	0.647	-0.38 0 .23	1.000
Daily Mile	-2.46	0.187	-6.11 1.19	-2.46	0.187	-6.11 1.19	1.000
After School Activities (n)	-0.11	0.593	-0.49 0.28	-0.11	0.593	-0.49 0.28	1.000

Lessons often taught Outside	0.26	0.770	-1.47 1.98	0.26	0.770	-1.47 1.98	1.000
Lessons often taught 1 Outside 2 3 4	------------ 0.49 1.09 0.53	Prob> chi^2 = 0.976					
School has had Training in Outdoor Learning	-3.20	**0.031**	-6.12 -0.30	-3.20	0.031	-6.12 -0.30	1.000
Forest Schools	-1.68	0.321	-5.00 1.64	-1.68	0.321	-5.00 1.64	1.000
Playground before school	1.86	0.275	-1.48 5.20	1.64	0.270	-1.27 4.56	0.108
Playground after school	1.96	0.300	-1.74 5.66	1.71	0.498	-3.24 6.67	0.112
School provides Outdoor Clothing	-2.01	0.221	-5.22 1.21	-2.01	0.221	-5.22 1.21	1.000
Active Transport Initiatives (n)	0.27	0.447	-0.43 0.97	0.27	0.447	-0.43 0.97	1.000
Walk to School Initiatives	2.56	0.144	-0.87 6.00	2.30	**0.083**	-0.30 4.90	1.000
Road Safety Training	1.28	0.473	-2.22 4.77	1.28	0.473	-2.22 4.77	1.000
Allows Scooters	0.35	0.848	-3.22 3.92	0.35	0.848	-3.22 3.92	1.000
Health Messages	3.037	**0.078**	-0.34 6.41	2.98	**0.067**	-0.21 6.16	0.731
Environmental Messages	0.22	0.900	-3.18 3.62	0.22	0.900	-3.18 3.62	1.000
Rules Displayed NO/YES	-2.82	**0.061**	-5.77 0 .13	-2.82	**0.061**	-5.77 0.13	1.000

Table 6.13 Associations between explanatory variables and TPA assuming random intercepts only (Left hand side) and random slopes (Right hand side)

Stepwise Procedure

A stepwise procedure was used to explore how combinations of the explanatory variables might predict TPA. Firstly, as one school (School L) did not provide information about gender, the data were initially modelled without that school included. A subsequent model including School L is later described.

The 12 variables which had at least a near significant association (p<0.1) with TPA (See Table 6.13) were entered into a multi-variable model in STATA (Table 6.14). At each step, the variable which had the least significant relationship with TPA was removed. This process continued until the final model was constructed in which all remaining variables showed a significant relationship with TPA (p<0.05). Steps involved the removal, in turn, first of Fixed Equipment, then Location, Perceived as Extensive, Time of Year Woodland Used, Rules Displayed, Gender and finally, Number on Roll as these were not having a significant effect on the prediction of TPA.

Explanatory Variable	Coefficient	n	p	95% Confidence Interval
School Year	-4.36	926	**0.001**	-5.92 -2.80
Gender	-1.29	926	0.105	-2.860 0.27
Number on Roll	0.01	926	0.207	-0.00 0.02
Location	0.84	926	0.760	-4.55 6.23
SATS Average	-0.12	926	0.367	-0.37 0.14
Sports Ambassadors	3.96	926	**0.009**	0.99 6.92
Training in Outdoor Learning	-4.92	926	**0.005**	-8.32 -1.51
Health Messages	9.94	926	**0.003**	3.33 16.54
Rules Displayed	-1.92	926	0.356	-5.98 2.15
Perceived as Extensive	-0.65	926	0.423	-2.23 0.94
Total Fixed Equipment	-0.09	926	0.849	-3.06 0.92
Time of Year Woodland Used	-1.07	926	0.292	-2.19 0.66

Table 6.14: **Initial** step for multi-variable model without school L

Each of the other potential explanatory variables was then entered back into this model. On doing this, 'Provides Outdoor Clothing' became a significant association and remained so when previously excluded variables were re-entered. The final model without School L included is shown in Table 6.15.

Total Physical Activity	Coefficient	N	P	95% Confidence Interval
School Year (Year 6)	-4.34	926	0.001	-5.90 -2.78
Provides Outdoor Clothing	-2.59	926	0.002	-4.22 -0.96
Sports' Ambassadors	2.67	926	0.002	0.98 4.36
Training in Outdoor Learning	-4.45	926	0.001	-6.28 -2.63
Health Messages	4.36	926	0.001	2.28 6.43

Table 6.15: **Final** model (Without school L)

As Gender was not found to be significantly associated with TPA, the stepwise procedure was repeated using the full dataset of 991 pupils (including School L). The 11 variables which had a significant or near significant association (p<0.1) with TPA were entered into a multi-variable model in STATA (Table 6.16). Steps involved the removal first of Fixed Equipment, then Perceived as Extensive, Time of Year Woodland Used, Rules Displayed and finally, Number on Roll as these were not having a significant effect on the prediction of TPA.

Explanatory Variable	**Coefficient**	**N**	**p**	**95% Confidence Interval**
School Year	-4.54	991	**0.001**	-6.05 -3.04
Number on Roll	0.01	991	0.204	-0.00 0.02
Location	1.17	991	0.612	-3.35 5.69
SATS Average	-0.13	991	0.260	-0.35 0.09
Sports Ambassadors	3.68	991	**0.014**	0.75 6.61
Training in Outdoor Learning	-4.76	991	**0.005**	-8.08 -1.43
Health Messages	9.12	991	**0.001**	4.28 13.95
Rules Displayed	-2.45	991	0.135	-5.65 0.76
Perceived as Extensive	-0.65	991	0.358	-2.02 0.73
Total Fixed Equipment	-0.03	991	0.938	-0.81 0.75
Time of Year Woodland Used	-0.77	991	0.293	-2.19 0.66

Table 6.16: **Initial** step for Multi-Variable model

Each of the other potential explanatory variables was then entered back into this model. On doing this,' SATS Average' was no longer a significant predictor. However, 'Provides Outdoor Clothing' became a significant associate and remained so when previously excluded variables were re-entered. The final model is shown in Table 6.17.

Total Physical Activity	**Coefficient**	**N**	**P**	**95% Confidence Interval**
School Year (Year 6)	-4.48	991	0.001	-5.98 -2.98
Provides Outdoor Clothing	-2.40	991	0.001	-3.95 -0.85
Sports' Ambassadors	2.80	991	0.001	1.20 4.40
Training in Outdoor Learning	-3.97	991	0.001	-5.55 -2.38
Health Messages	3.81	991	0.001	2.03 5.59

Table 6.17: **Final** Model after forward steps

As gender was not significantly associated with TPA, the final model based on all 991 participants was used as the best fit for the data (Table 6.17). In this model, Year group showed a statistically significant negative association with TPA. On average, Year 6 scored 4.48 PA units less on self-reported PA than Year 5.

Of the school level variables, training pupils to be Sports' Ambassadors was a positive predictor of TPA. On average, schools which trained their children in this role scored approximately 2.8 PA units more for TPA than schools that did not have Sports' Ambassadors. Children scored on average 3.8 units higher on TPA when their school provided Health Messages in the Curriculum relating to active transport than those at schools which did not. Providing Outdoor Clothing and Training in Outdoor Learning were both negatively associated with TPA. Children were, on average, approximately 2.4 PA units less active over the course of a day when they attended schools that provided outdoor clothing compared to schools where outdoor clothing was not provided and where schools had engaged in recent training about outdoor learning, their pupils scored nearly 4 PA units less on TPA than at schools which had not undertaken recent training.

The final model (Table 6.17) explained more of the variance than the empty model (Table 6.8) with the variance being reduced from 157.18 to 144.14. In the multi-variable model, the between-schools residuals became negligible. Variance at the school and individual levels is shown in Table 6.18

TPA Model	Between School Component	Within School Component	VPC	Total Variance
Null Single Level				158.23
Null Multilevel	6.72	150.46	0.040	157.18
Final Model	0.00	144.14	0.000	144.14

Table 6.18: Variance components at the individual and school level for univariate and multiple linear models

6.4.3.7 CHECKING MODEL ASSUMPTIONS

Figure 6.7 shows plots of explanatory variables from the final model against TPA.

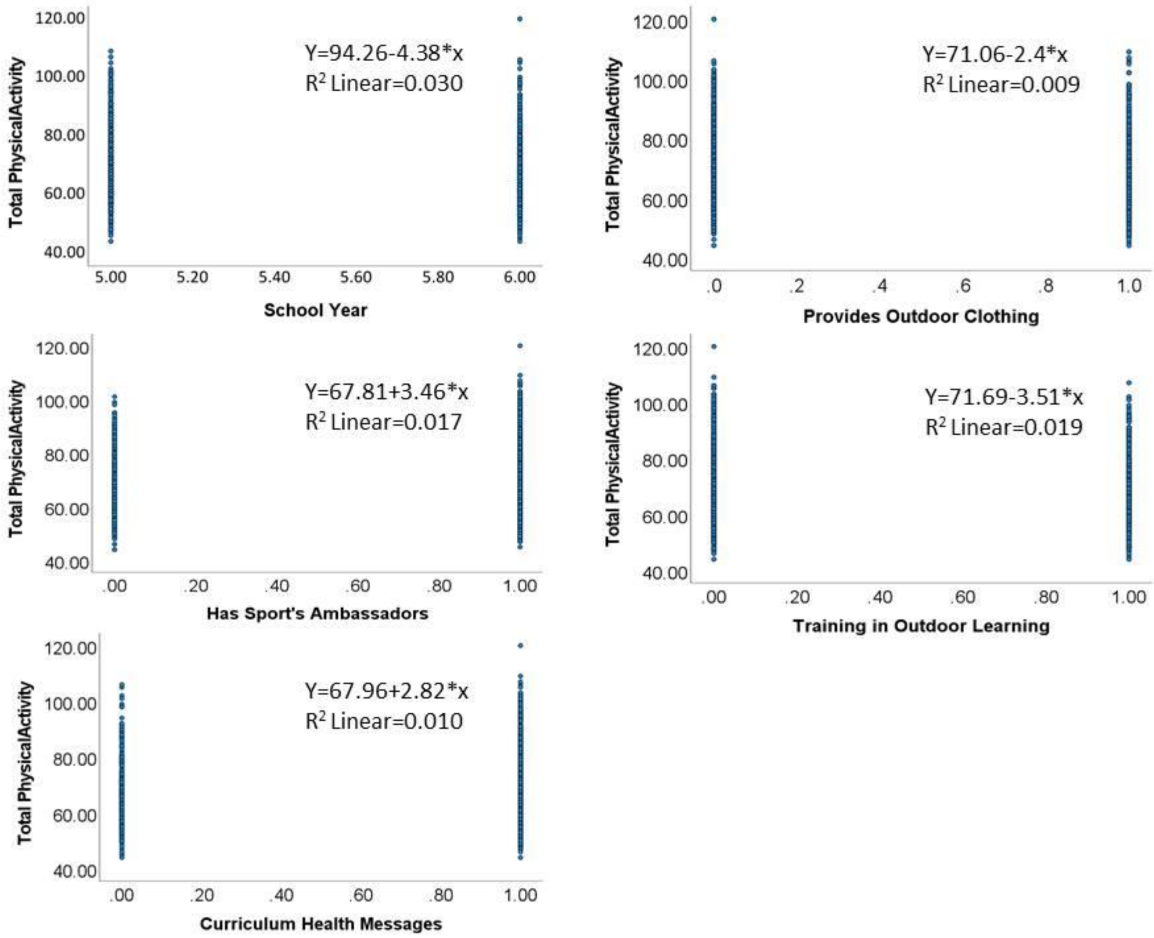


Figure 6.7 : Linear Relationships between explanatory variables from final model and TPA

A plot of residual values against TPA is shown in Figure 6.8. No distinct pattern was evident in the residuals plot and data points appeared to be scattered randomly around the zero line, demonstrating evidence of linearity.There was also no clear pattern indicating heteroscedasticity so it was considered to be that the assumption of constant variance was not violated in the data under investigation.

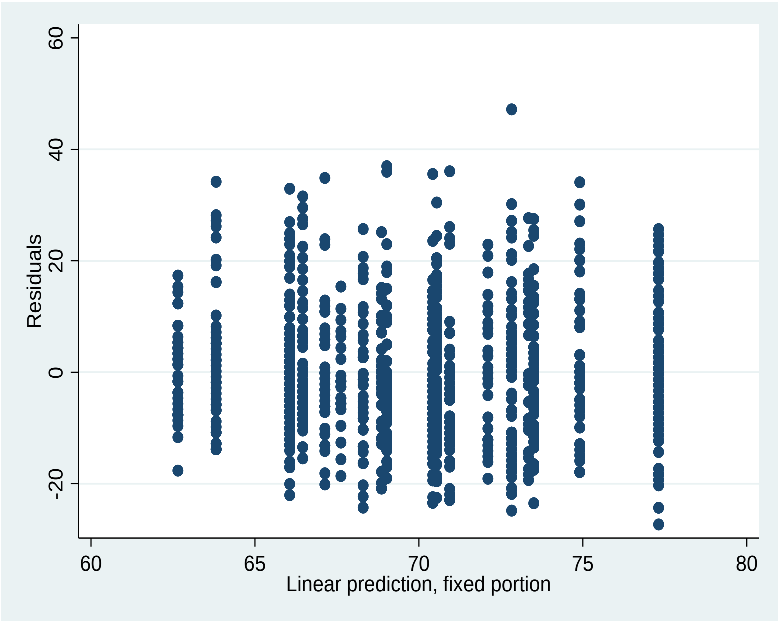


Figure 6.8: Scatterplot of Residuals vs Predicted Values

A histogram of the residuals showed slight deviations from a normal distribution (Figure 6.9).

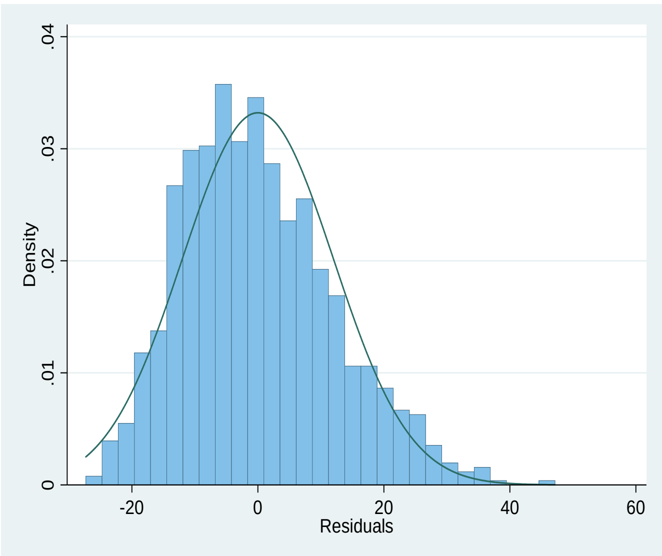


Figure 6.9: Histogram of the Residuals

A normal quantile plot (Figure 6.10), a normal probability plot (Figure 6.11) and a kernel density plot (Figure 6.12) did not suggest any major violation of normality even though there were some small deviations from a normal distribution.

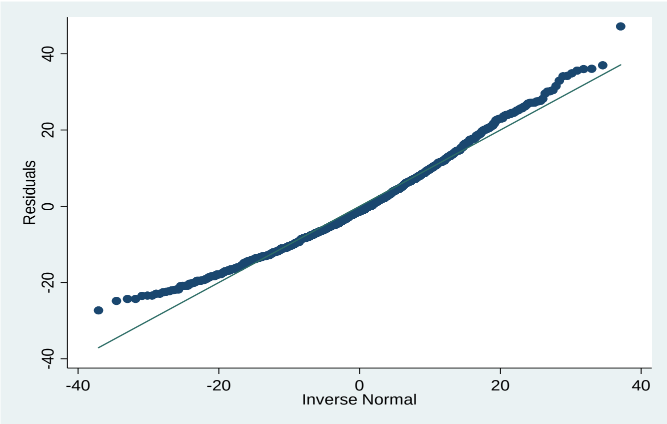


Figure 6.10 :Normal Quantile Plot.

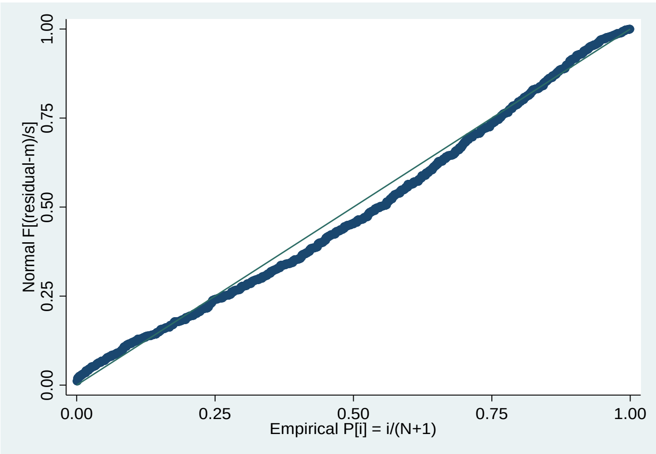


Figure 6.11 :Normal Probability Plot.

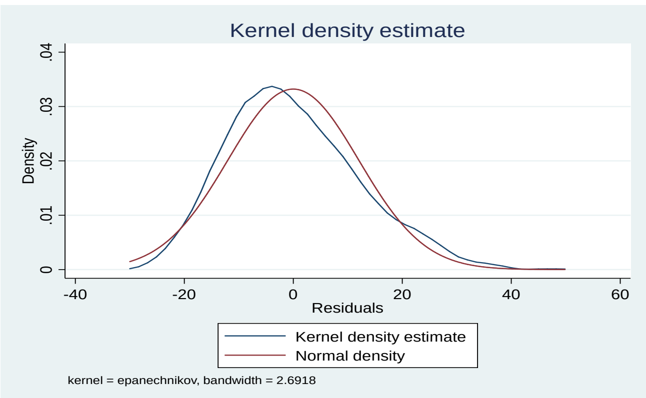


Figure 6.12 :Kernel Density Plot

6.5 DISCUSSION

A multilevel statistical approach was used to evaluate the importance of school outdoor environmental factors with respect to children's PA levels. This study found that a small number of these school level characteristics (children trained as sports' ambassadors (B= 2.80 p=0.001); health messages in the curriculum to support active transport (B= -3.81 p=0.001); provision of outdoor clothing (B= -2.40 p=0.001); recent training in outdoor learning (B= -3.47 p=0.001) were associated with children's PA levels across a whole day, with most of the variation in PA being explained at the individual level due to school year (B= -4.48, p=0.001) rather than gender.

These results are in keeping with other work which has found few (Mantjes et al, 2012; Pereira et al, 2020) or no school factors relating to children's PA (Salway et al, 2019). Mantjes et al (2012) found that longer breaks and additional road safety features were associated with higher levels of accelerometer recorded PA in school-children and Pereira et al (2020) reported a negative association between playground dimensions and PA. In the current study, subjective estimates of the size of outdoor space were not found to be associated with TPA.

A key finding is that higher values of TPA were found at schools where children were trained as part of the 'Young Ambassador' scheme, in the role of 'Sports' Ambassador.' The aim of the Young Ambassador programme is to motivate and empower young people to lead others, through positive action, to get involved in sports, PE and healthy living (Youth Sport Trust, 2019). Their responsibilities might include talking to others about how to be healthy and active, perhaps through an assembly, refereeing games for others at break times, setting out and leading playtime games or introducing new sports to other children. Whether or not some kind of leadership role for children might have some influence on their peers with regard to PA has been studied in a small number of interventions (Barr-Anderson et al, 2012; Dudley et al, 2018a; Spencer et al, 2014). Positive effects of these trials were reported in all cases, with intervention groups having higher self-reported time spent in MVPA (Barr-Anderson et al, 2012), a higher number of pedometer steps (Spencer et al, 2014) and a decrease in sedentary activity and increase in VPA (Dudley et al, 2018a). One limitation of these studies is the the difficulty in isolating the specific effects of the social strand of an intervention.

Taylor et al (2018) examined the feasibility of a socially driven playground intervention involving adult and child input and concluded that older children might not respond well to adults intervening in their games at break times. Other researchers, too, have reported negative associations between heavy adult supervision during break times and PA (Carlson et al, 2013; McKenzie et al, 2010). It is plausible that a role such as that of ambassador might circumvent an overt adult input and could be of particular use for encouraging the more mature children in the later stages of primary school to be more active. In the current study, adult encouragement for using equipment during break times was not found to be associated with the level of children's TPA.

Studies suggest that there is a relationship between children's PA and the encouragement, example and influence of their friends and peers (Swanson et al, 2019). Creating positions such as sport's ambassador might tap into this natural social resource. It is interesting that other roles such as 'play leader' or 'buddy' were not significantly associated with children's PA in this study. Subtle differences in the roles may have important implications when it comes to facilitating PA in the school playground and investigating these could form the basis of future research.

A second main finding in the current study is that children were, on average, more active at schools which promoted ATS through health messages in the curriculum. Few studies have specifically investigated associations between health education and active transport. One, albeit exploring ATS in 15 year old students found that active transport was higher where schools have a written plan for implementing their aims for health promotion (Hollein et al, 2017). In addition, where schools were part of a health-promoting network, there was a higher probability that girls would use active transport. Børrestad et al (2012) included a focus on cycling-related health benefits in a multi-component RCT for young adolescents and reported no differences between the intervention and control groups for cycling to school. A focus on a healthy lifestyle and the body was also part of a Scottish program, 'Travelling Green,' which was used as the basis of two quasi-experimental trials (McKee et al, 2007; McMinn et al, 2012). While the first of these found the intervention to be effective for improving ATS behaviours in the intervention group, the second reported no significant differences between the intervention and control groups. The different findings could be attributed to the different methods of PA measurement between the studies or perhaps a seasonal effect which could have attenuated the intervention effect in the second study. As in the Børrestad study, there were a number of strands to these trials, making it difficult to assess what the specific impact of health education alone might have been.

Changing active transport behaviours in children is contingent on parental decisions as they have the final say in how a child travels to school so if a school intervention is to be successful, it will need to be accessible by both children and their parents. It seems that health is viewed by many parents themselves as an important reason for ATS. When parents were asked to rate the benefits of a SRTS event, for example, during an evaluation study, 71% thought that 'exercise and health' were the most important (Buckley et al, 2013). In one UK study of parental perceptions of ATS, 'health and well-being' was viewed as one of a number of key themes which drove choices regarding travel to school (Nikitas et al, 2019). ATS was seen as being a healthy choice for children and adults alike, contributing to daily exercise and helping to combat problems such as overweight or asthma. Seventy percent of parents in a second study of parental attitudes to ATS believed that their children would be healthier by travelling actively to school (Rutberg and Lindqvist, 2019). However, these beliefs are seated amongst others in a complex web of concerns about safety and practical issues (Nikitas et al, 2019; Rutberg and Lindqvist, 2019).

Notably, Rutberg and Lindqvist (2019) found that these barriers to ATS reported by parents were somewhat overcome by their children's response to an inclusive educational intervention programme designed to increase knowledge and motivation through health, safety and environmental themes, with the use of gamification to motivate children to behave in healthy ways. Children were reported to become highly motivated and, in turn, were sometimes able to motivate their parents to allow them to commute actively to school where before, perhaps, they were not allowed to do so. Talking about keeping healthy became an activity at home for some people and some families continued to travel actively after the end of the intervention. Children's motivation from the school educational sessions seemed to be useful for getting parents on board despite some of their misgivings. Parents, too, were an integral part of developing the intervention as were teachers at the schools who designed challenges for the children, measured distances and provided rewards as part of the motivational programme. While this qualitative study is not necessarily generalizable, it does demonstrate that it is possible to change attitudes through relatively simple strategies. Active involvement of school staff and parental involvement have been reported previously to be features of the most effective interventions in a systematic review of interventions for promoting ATS (Chillón et al, 2011).

The finding in this study that children at schools where staff have received training in outdoor learning in the past two years were less active by nearly 4 PA units is somewhat surprising as there is evidence that structured learning in the outdoor environment in schools is associated with higher levels of PA (Aronsson et al, 2015; Finn et al, 2018) and it might be expected that more expertise in provision might be associated with more PA. A similar kind of effect has been seen previously (Martin et al, 2012) when daily MVPA at break times was nearly 5 minutes less when classroom teachers had taken part in professional development for PE within the past two years compared with at schools where teachers had not undertaken additional training for PE. It could be the case, perhaps, that schools which notice a deficit of some kind in their provision or in student outcomes allocate funding for training in a bid to improve the situation. As both of these studies were concerned with 'recent' training, new initiatives and policy as a result of the training might not have had time to come into effect across the school. It may also be that receiving training has not been sufficient for teachers to feel competent and confident about the delivery of outdoor education and on-going professional development may be necessary before outdoor learning can be established with confidence. Development of teachers' confidence and self-efficacy has been highlighted previously as a necessary pre-requisite for ensuring progress in learning outside the classroom (Dillon and Dickie, 2012).

A further finding of this study which is also somewhat counter-intuitive is that where schools did not provide outdoor clothing, children were more active than at schools where outdoor clothing was provided. If children are given the means to stay outside to play in all weathers through borrowing waterproofs or sunhats, it could be supposed that they might continue to be active. However, Van Sluijs et al, (2011) reported no association between school policy allowing children to play outside in any weather and PA. Also, Harrison et al (2011) found that children who played out in wet weather where school policy allowed them to were actually less active than those who remained indoors. The result might therefore be to do with an aspect of school culture that is not explicitly examined yet is associated with the phenomenon. For example, perhaps schools which provide spare clothing have a staff culture erring on the side of caution and vigilance which might lead to strict regulation and even restriction of active play behaviours (Caro et al, 2016; Eskola et al, 2018; Hyndman et al, 2015). Conversely, some schools might strongly advocate outdoor play and encourage children to come prepared. It could also be that, at some schools, many children turn up to school with suitable outdoor clothing due to family/local culture that encourages outdoor play in any weather conditions. In these situations, there would be little need for the school to provide outdoor clothing.

Significantly lower values of PA were recorded by children who were only one school year apart in this study, with Year 6 children reporting that they participated in nearly 4.5 units less PA across the whole day than the younger pupils. A pattern of decreasing PA with age is a general finding in the literature, although more recently, evidence suggests that this decline begins much earlier than previously thought, from as young as age 5 (Cooper et al, 2015) or 7 (Farooq et al, 2018) and that there are different patterns of age related change in PA across groups of young people (Farooq et al, 2018; Kwon et al, 2015; Pate et al, 2019). Further investigation of atypical trends is needed in order to understand their significance and relevance for making environmental changes. Boys were more active than girls in the present study which is consistent with the literature (eg. Cooper et al, 2015). However, the difference was not statistically significant.

In this study, a key line of enquiry was to explore which school factors were associated with PA. The school environment is viewed as one well suited for encouraging children to be active (Pate et al, 2006) and for helping them to meet recommended activity levels with accompanying health benefits (DHSC, 2019). It has been shown that some school level factors are significantly associated with children's PA, with positive associations of up to 3.8 PA units representing the significantly higher values of PA recorded by children at schools that promote ATS through health messages compared with those at schools which do not promote active transport in this way and smaller positive gains for those with sports ambassadors.

In terms of making a difference to children's daily PA, it is necessary to understand what this value means with respect to National Guidelines. In very general terms, an assessment of this can be made by considering what the PAQ scoring system equates to in the school environment. When children respond to the PAQ, they judge whether they have taken part in an activity 'a little' (2 PA units) or 'a lot' (3 PA units). Consequently, the value of 3.8 could mean that children at schools which use health messages, on average take part in 1-2 activities 'a little' more during the day than children at schools which do not or, perhaps one main activity 'a lot.' It is possible, therefore, that for some children, who particularly enjoy a sport such as basketball or football, this could involve playing the game 'a lot' throughout a lunch-break, for example, or with their friends after school resulting in a substantial number of minutes of MVPA.

For a more objective evaluation, the PAQ needs to be compared with an objective measure of PA. Quirk (2016) measured the PA of children with diabetes before and after a PA intervention through the use of the PAQ and accelerometer. A strong association was observed between accelerometer and PAQ measurements indicating that children who scored more highly on the PAQ had higher levels of MVPA recorded by accelerometer. The researcher found a difference of 17.4 (SD=0.64) minutes for the intervention group between baseline and follow-up points estimated via accelerometer and 4.8 (SD=0.54) PA units with the PAQ. For the whole group, the difference between the two points was 15.4 (SD=0.57) minutes via accelerometer and 4.5 (SD=0.58) PA units as measured using the PAQ. For the control group, the two values were 14.2 (SD=0.40) minutes and 2.6 (SD=0.45) PA units.

There is, therefore, perhaps some basis to estimate that 3-4 PA units could represent several minutes of PA. These minutes could make a valuable contribution to the recommended minimum daily 'dose' of PA for children, especially as recent evidence indicates that even short bouts of exercise can be valid contributors to this target and longer bouts are not, per se, associated with greater health benefits (Tarp et al, 2018).

6.5.1 STRENGTHS AND LIMITATIONS

Strengths of this study include the good sized sample of children from a varied set of schools with a high response rate in participating schools. This indicates a broadly representative sample from within those schools. The use of a survey specific for the study population of schools and the outcome measure and the PAQ designed for use by children characterising typical PA across a school day and in the school environment are further strengths as well as the use of multi-level analysis to account for clustering within schools. Four percent of the variance in TPA was found to be attributable to the schools in this study which means that the biggest part of the variance in PA scores can be explained by children's individual characteristics, with the social and environmental context of individual schools making a much smaller contribution. It is still the case, nonetheless, that a model allowing for this clustering effect was significantly more accurate than a model which did not account for school factors. In addition, the inclusion of a variety of policy and social explanatory variables which have previously been under-explored in correlational research contributes to the knowledge base in this field.

There are too, some limitations. Although the response rate for children within schools was high, the sample of 12 schools may not be representative of Midland's schools. Schools were self-selected and had higher proportions of pupils eligible for pupil premium. Whilst the 12 schools did not differ significantly from the 56 other schools that completed the survey in other respects, the total sample of 68 schools that completed the QSOE survey was unlikely to be representative of Midlands Schools in general as response rates for completing the survey were <3%. Nonetheless, the sample of 12 schools was varied in terms of school size, location and SES. Whilst the PAQ has been shown to be fairly accurate when compared with objective measures, the self-reported PA data may have been biased and therefore inaccurate in a number of ways. As the PAQ does not differentiate between activity levels, it is also difficult to clarify the children's levels of MVPA so it is not possible to measure how much of the daily recommendation is being achieved or to make comparisons with other work. As the objective was to investigate associations, this was not necessarily a problem. Within the constraints of this research study, the relatively low cost and ease of delivery for schools meant that the PAQ was a good choice of instrument.

The QSOE survey was not checked for reliability. Respondents for the schools may have completed the survey inaccurately, perhaps due to incomplete knowledge of school procedures and ethos or to portray the school in a favourable light, potentially rendering subsequent associations with PA unreliable. This research is cross-sectional so causal inferences cannot be made. Longitudinal research is needed to demonstrate that differences and changes in the school environment precede changes in PA. As many variables were assessed in this study it is possible that some significant associations may have occurred by chance.

6.6 CONCLUSIONS

To conclude, this study found that a small number of school level factors were associated with children's self-reported PA in UK Midlands schools. At schools where children were trained as sports' ambassadors and where health messages were provided in the curriculum to support active transport, children were more active although they were less active at schools which provided outdoor clothing and which had had recent training in outdoor learning. These social and policy school explanatory variables have been infrequently studied and could be investigated further in schools at different locations, through experimental designs and by using objective methods for measuring PA.

CHAPTER 7: GENERAL DISCUSSION

7.1 INTRODUCTION

The aim of this thesis was to use a mixed methods approach to gain a deeper understanding of primary school factors associated with children's PA in the outdoor environment which could be of benefit to school staff and researchers who are seeking to implement successful interventions and strategies for facilitating higher levels of PA in primary school children and to develop a survey to capture this information. In this final section, findings from each chapter will be summarised and a refined list of potential QSOE questions presented based on the findings of the thesis. These could be used to assess the primary school environment for research-based purposes such as informing intervention development or as a checklist by schools that are considering changes relating to PA. Some recommendations for schools are proposed.

As described in Chapter 1 (Section 1.7.3), the studies in this thesis were undertaken as exploratory research. Critical realists such as Pratshke (2003) argue that theoretical knowledge of underlying generative mechanisms is only possible through the scrutiny of their observable effects and in this thesis, some observations and patterns that could provide some pointers for continuing study have been revealed. Whilst being the final chapter of this thesis, therefore, the observations of the thesis lend themselves well to being the starting point for further investigations to clarify and confirm the current findings and for deeper exploration of the mechanisms and processes determining PA behaviours in school settings. Some possibilities for future research are suggested in this chapter.

7.2 SUMMARY OF CHAPTERS AND FINDINGS

In Chapter 1, the health benefits of PA in children were highlighted and key aspects of PA outlined. The potential for primary schools to promote children's PA was identified and supported by findings from some systematic reviews which provided evidence that primary school interventions can have positive effects on children's PA (Demetriou and Honer, 2012;

Jones et al, 2020; Van Sluijs et al, 2007). The outdoor environment was seen to offer possibilities for school promotion of PA such as during break times in the day (Parrish et al, 2020; Sánchez and Gallego, 2021; Suga et al, 2021). Tools for evaluating school outdoor environments were described and it was observed that children's perspectives had rarely been included in the development of previous measures.

The importance of involving children in research about their PA was brought to the fore and it was emphasized how, both legally and in the interests of purposeful research, children's views need to be considered when finding out about their world and designing interventions that are targeting their behaviours. An examination of the wide variety of participatory methods developed for working with children in a research context, considered to enhance the research experience and to help children to verbalise and express their thoughts helped to inform the choice of a practical task for use with children in a school setting. The theoretical framework for the studies in this thesis was also described outlining how mixed methods for exploring factors associated with children's outdoor PA at school allow the topic to be examined from different angles and at different depths.

In **Chapter 2,** the aim was to gain understanding about potential school-based correlates of primary-aged children's PA in the outdoor environment and to evaluate the evidence to date in this field by means of a broad review of the literature. Findings showed that this work has quite often been through qualitative and correlational studies which have identified numerous potential characteristics of school provision which could influence children's PA, with fewer interventional studies having been undertaken. Study designs and results have varied widely.

Some physical attributes of the playground and modifications of that space to support children's PA are aspects of school provision which have been studied more frequently through controlled intervention studies, with many PA benefits for example, of line markings or loose/fixed equipment being reported. However, despite this often positive impact, school-place interventions are not always straightforward. Staff attitudes and concerns, for example, have been seen to limit children's capacity for active play even when equipment is provided (Bundy et al, 2009; Engelen et al, 2013). Furthermore, different groups of children have been observed to access facilities in different ways according to their personalities, physical capabilities and interests so that even when new facilities are present, they may only appeal to a small sub-set of children at a school (e.g. Huberty et al, 2011; Huberty et al, 2014; Saint-Maurice et al 2014; Stellino et al, 2010).

Social influences on children's PA have become increasingly studied with qualitative and cross-sectional work showing that adults may have an important role to play in facilitating children's PA in the playground, although what the nature of that role needs to be is not yet clear and it is likely that some children will benefit more than others from having adults involved in their playtime behaviour (See section 2.3.9). Children's influences on their peers' PA through peer networks and designated roles are the subjects of other studies which have highlighted the potential importance of friendship, leadership and role-modelling for promoting children's PA (See section 2.3.8).

Additional social and behavioural strategies involving co-operation and competition promoted and delivered through gamification techniques were present in more recent studies, aiming to increase PA through ATS and playground strategies (Foote et al, 2017; Galbraith and Normand, 2017). It could be that these types of social reinforcement techniques, driven by goals and rewards might be one mechanism for drawing children in to being physically active, particularly those who lack intrinsic motivation. Whilst it may be desirable to inculcate a liking for PA per se, some children might be resistant to most efforts made to inspire them to be active and simply prefer other activities. For these individuals, incorporating gamification elements into a rolling programme of choices for children over the course of an academic year might encourage them to be drawn in periodically by extrinsic factors.

It was also seen that by tapping into children's natural desire to play and to be creative and their natural propensity towards being active in the outdoor environment through providing interest during break-times and meeting educational learning objectives through outdoor lessons, schools could, potentially offer opportunities for children to gain regular doses of PA without detracting from curriculum time. Whilst gains in PA during specific segments of the school day have been shown to be small, a combination of opportunities at varied points in the day might allow children to accumulate valuable minutes of MVPA.

A photo-ordering task was used in **Chapter 3** to explore the relative merits of using focus groups or individual interviews for exploring children's perceptions of how school can support them to be active in the outdoor environment and, although both methods were found to be suitable for collecting information from children about PA, interviews elicited more information about aspects of the outdoor setting at school which could be feasible for PA promotion. Their potential for enabling all children, whether more or less active, to voice their opinions was thought to be important in exploratory work in which the aim was to access a wide range of views.

Interviews were therefore chosen for working with children in the qualitative study described in **Chapter 4** alongside the photo-ordering task which successfully enabled children to add detail to their responses about their perceptions of PA in their school outdoor environments. Through content analysis, information was collated about the wide range of equipment, games and activities adults and children thought to be beneficial for facilitating children's PA whilst at school and strategies thought to be important for encouraging ATS. A thematic analysis found 9 main themes which were reported in section 4.4.2.

The results from Chapter 4 suggested that, in order to benefit a larger proportion of pupils, schools need to offer opportunities with an emphasis on providing accessibility, variety and challenge. Building a stimulating playground for all children might involve the creation of different areas which can be accessed all year round, including quiet, natural spaces together with hard-surface areas. Facilities such as high climbing equipment, tunnels, mazes and swings could be installed to satisfy the need for children to take risks and to be creative in their active play and inexpensive, yet varied items of loose equipment could be introduced to the playground on a periodic basis to renew children's enthusiasm and excitement to engage with it in the outdoor setting. It has been suggested that non-prescriptive elements, such as logs, boulders or large sand-pits which can be used in multiple ways will give children the chance to tap into their innate creativity and desire to play, fostering the development of active play behaviours (Learning through Landscapes, n.d.).

It was also seen in Chapter 4 that a trim trail was considered to be an important piece of equipment for encouraging children to be active, perhaps offering an alternative choice for girls and other children who do not enjoy team sports. With multiple opportunities for climbing, balancing, dangling and swinging, a trim trail can lend itself to being used in many ways and being incorporated into children's games. Given the freedom and the means to participate in active, creative play with fixed or loose items and equipment has been reported to allow children the chance to be imaginative and diverse in their movements and stretch the limits of their abilities, physically, cognitively and socially (Hyndman and Mahony, 2018; Mulryan-Kyne, 2014).

From the results of Chapter 4 it can also be seen that school policy could have a positive role to play in determining PA practices. Policies could include the development of rotas which allow access to space, spaces and equipment, the allocation of funding to pay for facilities such as cycle storage and wet-weather surfacing and the introduction of systems which enable children to make best use of the equipment they have available. These are types of policy that have, to some extent, already been studied although there is mixed evidence as to whether these or other types or combinations of policies to promote PA might be associated with children's PA. Some social aspects of school life, too, such as active adult engagement or children's support of each other through designated roles could have an important role to play in facilitating children's active behaviours.

A combination of these results together with the findings from Chapter 2 were used to develop the QSOE, a 47 item survey which was completed by 68 English primary schools. The development and distribution of the QSOE was described in **Chapter 5.** Unlike most other surveys of this type, this tool incorporated children's ideas as well as those from across adult communities in schools, thus ensuring a wide, relevant question frame, specific to the population under study. Respondents to the QSOE were thorough and many provided additional information when prompted, thus illuminating the rich and diverse provision being made by most of the participating schools to encourage children to be active in the outdoor environment. As school recruitment was difficult via an online platform, alternative methods of surveying schools may be more successful for future studies.

The aim of the study described in **Chapter 6** was to examine, through the use of multi-level linear regression, the relationship between primary school children's self-rated PA and school-level variables derived from the QSOE and a small number of variables was found to be related to children's PA. Two school-level variables were found to be positively and significantly associated with children's PA; children trained to act as Sport's Ambassadors and Health Messages in the Curriculum provided relating to ATS, whereas at schools which provided outdoor clothing or which had undertaken recent training in outdoor learning, a significant and negative association was found with children's PA. This chapter has, therefore, highlighted some potential areas of importance in the study of school-based correlates which have not yet been studied in depth and which could be used as part of intervention-based studies to gain further knowledge of what schools can do to encourage young people to be active.

7.3 STRENGTHS AND LIMITATIONS

Guided by an ecological model for explaining children's PA, this thesis has explored the contribution of the school outdoor environment to children's PA in depth, with its use of mixed methods being a strength, allowing multiple voices to be heard and to further understanding of the school effect on children's PA. In particular, through the qualitative methodology in Chapter 4, children were given opportunities to explain how they perceived that school factors influenced their levels of activity. Children's perceptions of facets of their environment such as equipment, large spaces, outdoor lessons and of having adults on the playground, were seen to vary considerably and an appreciation of these differing opinions could aid in the design of suitable facilities and experiences for children of all ages and abilities, active and inactive, from different SES backgrounds, boys and girls, which encourage them to be active.

A further strength of the work in this thesis is the use of methods and tools which are specific to the population under study. Interviews were shown in Chapter 3 to be a good choice for working with children in a school setting to understand their thoughts about PA in the school outdoor environment, the QSOE was a questionnaire developed specifically for the population of schools under study, by members of school communities who knew the environment well and the PAQ, being a previous day recall instrument which centred around the school day and provided children with visual cues to aid memory, was ideally suited to the study population.

Whilst being a low-cost, low-burden choice for measuring PA, the PAQ, nonetheless was subject to the problems inherent in this type of measurement tool and may not have assessed children's levels of PA accurately. The QSOE was not adequately validated and so its effectiveness for describing the school outdoor environment has not yet been established. The observational nature of the studies too, did not allow causal relationships to be understood. Where schools provided training for outdoor learning, for example, children were less active and the cross-sectional nature of the study meant that this unexpected relationship could not be explained. Also, difficulties in the recruitment of schools meant that the sample of surveyed schools in Chapter 5 could not be considered to be representative which limited the generalisability of these results. In addition, self-selection bias could have occurred in Chapters 4 and 5, possibly resulting in some views being under-represented.

The very small sample size in Chapter 3 also limits the conclusions that can be drawn from that study. It could be that the findings were to do with the unique make-up of the focus group on the day of data collection. While some authors consider focus groups to be a method that creates a natural group situation for a child, reminiscent of other peer interactions (Gibson, 2012), the children in this study did not, initially seem to find the situation comfortable and did not find it easy to convey their thoughts and opinions without a considerable level of prompting and questioning. The particular mix of interactional processes occurring on this occasion could have contributed to the differences found between the focus group and individual interviews and whether or not group processes might operate like this more systematically in children's focus groups is an interesting consideration. Previous comparisons, too, between the methods have shown that interviews can be more facilitative of idea production in children (Heary and Hennessey, 2006) and adults (Fern, 1982; Guest et al, 2017; Rat et al, 2007) with Fern (1982) concluding that item generation in focus groups was reduced in their study as a result of group processes.

It could be that with a more homogeneous focus group, as recommended by some authors (e.g. Clark, 2011; Gibson, 2012), perhaps made up of children who were all particularly interested in physical activity or all one gender, group participants might have felt that they could communicate in a more harmonious way. However, this focus group did consist of children who knew each other well and who were closely matched in age and it seems likely that other groups of this age might also contain at least one child who could be shy and one that could assert their own views strongly as in the current study. Equally, it is possible that a child who might speak out strongly, supported by peers in the focus group setting, might be influenced by the power imbalance between adult and child in a one-to-one interview and speak less whereas a shy child might feel more comfortable expressing views to a supportive adult during an individual interview than in front of peers in a group situation.

7.4 SUMMARY CHECKLIST OF KEY FACTORS

In this section, some questions are presented (See Table 7.1) which were derived from the results of the literature review and experimental work that have been completed as part of this thesis. These could be used by schools as a check-list against which they could appraise their own outdoor environments and as the starting point in research for developing a tool that discriminates between schools where children are more or less active or to identify components for a school-based intervention.

QUESTIONS FOR CHILDREN	HOW TO INTERPRET THE 'SCORE'
1. Is the playground a fun place to be? (Emoji rating scale 1-5) 2. How safe do you feel in your playground? (Emoji rating scale 1-5) 3. How much do you like the look of your playground? (Emoji rating scale 1-5) 4. How much do you like the equipment? (Emoji rating scale 1-5) 5. Do you have enough space to play your games? (Yes=1/No=0) 6. Is equipment available for the games you enjoy playing? (Yes=1/No=0) 7. Do you feel like being active in your playground? (Yes=1/No=0)	These questions could be completed by a sample of children across the school, including boys and girls and members of each year group. An average 'score' could be obtained for each sub-group of children which would range from 4-23 with a higher score representing a school environment that might be more likely to encourage those children to be active .
PHYSICAL DOMAIN	
1. Does school provide separate areas for energetic team sports? (Yes/No) (e.g. zones/Smooga/fences/designated areas) 2. Does school have a range of distinctive areas where children can play? (Yes/No) (e.g. quiet spaces/courts/hard play area/field/areas between buildings) 3. Does school have greened areas where children can play? (Yes/No) (e.g. gardens/wood/wildlife area/grassy banks) 4. Does school have a trim trail? (Yes/No) 5. Does school have a climbing frame/climbing wall? (Yes/No) 6. Does school offer a range of fixed equipment and line markings? (Yes/No) 7. Does school offer a range of loose equipment? (Yes/No) 8. Does school have covered areas for outdoor learning? (Yes/No)	If the answer is 'yes' score 1 The 'score' for this section ranges from 0-8 with a higher score representing a physical outdoor environment that may be conducive to children being more active. Additional points could be added • for **wide variety** of equipment • for **wide variety** of spaces
SOCIAL DOMAIN	
1. Does school offer children the opportunity to take on trained roles of responsibility in the playground? (e.g. buddy/sports'ambassador/play leader) 2. Does school involve children in creating playground rules and making changes? 3. Are adults actively engaged in the playground during break-times? (e.g. active participation in games and activities/ making equipment available/managing conflict/organising games)	If the answer is 'yes' score 1 The 'score' for this section ranges from 0-3 with a higher score representing a social environment that may be conducive to children being more active.

POLICY DOMAIN	
1. Does school enable the use of loose equipment? (e.g. through rotas/easy access/replacement of lost or broken items) 2. Is fixed equipment accessible throughout the year? 3. Are greened spaces accessible throughout the year? 4. Is field accessible throughout the year? 5. Does school use rotas/staggered breaks to maximise space per child? 6. Does school offer challenges/allow children to take risks in the playground? (e.g. climbing trees, high climbing frame, fast running games, snowball fights, complex gymnastics manoeuvres, conkers, piggy-back, balances with more than 1 child) 7. Do playground rules limit exploration and challenge? (Score 1 for no and 0 for yes) 8. Does the school encourage and facilitate a wider variety of games at playtimes than football alone? (e.g. basketball/cricket/tennis/netball) 9. Does school explain health benefits of active transport to children? 10. Does school incorporate outdoor education activities into the KS2 curriculum? 11. Does school incorporate INSET activities concerning outdoor education?	If the answer is 'yes' score 1 (reverse score question 7) The 'score' for this section ranges from 0-11 with a higher score representing a policy environment that may be conducive to children being more active.

Table 7.1: School Checklist

7.5 RECOMMENDATIONS FOR SCHOOLS

In the following paragraphs, some suggestions are made for schools that are aiming to facilitate children's PA through utilising the outdoor environment to a greater extent and are planning to make structural or policy changes.

Variety in equipment seems to be an important factor for encouraging engagement of boys and girls and children of different ages and interests in PA. It may be particularly important for schools to consider installing some equipment that is of special interest to girls such as slides, group swings or basketball hoops and providing areas for all children such as gardens, willow tunnels and quieter spaces to encourage imaginative play for those who are not so interested in team games. Schools could, perhaps physically separate an area in their play space for energetic ball games, so that other children are able to play in a calm environment. In addition, schools could ensure that sufficient loose equipment is accessible for popular playtime games and that it is distributed in such a way that all children are able to have their turn with it. In this way, children who are less confident in a busy social environment might still have the chance to participate in activities of their choice. Surveying children themselves within a school might provide useful information regarding the games and sports that boys and girls would like to have on offer, allowing schools to budget accordingly for playtimes and to offer corresponding extra-curricular activities.

Variety in the playground could also be renewed through regular change of small, inexpensive playtime objects which stimulate interest such as frisbees, diabolos, bean-bags or stilts which could be rotated over time. As children seem to have an interest in and ideas about the design of equipment, schools might also benefit from allowing their input when deciding on new playground features. This could happen through consultative groups such as the School Council through which pupils could offer suggestions or via design projects or competitions across the school. Location and playground surfacing also needs to be considered when installing or replacing equipment so that wet weather does not render the item/s inaccessible.

Increasing challenge in the playground might encourage children to remain active as they move into the higher year groups. This could be through the installation of higher/more complex climbing frames, allowing tree-climbing or, perhaps, offering the chance to construct dens with recyclable materials. Children could maybe be allowed to engage in fast running games in a partitioned area or to try out complex gymnastics manoeuvres and balances on safety surfaces. In addition, by integrating the curriculum with outdoor education activities, children may be more likely to be more active during the school day whilst educational targets are still being met and minimal time being taken away from core subjects. Whilst making these kinds of adjustments could mean significant school culture changes involving extensive staff training, re-visiting and re-writing policy and, importantly, consultation and events with parents, long-term outcomes could be very positive in terms of children being less sedentary and more active. ATS, too, could be facilitated by the school through the provision of cycle storage and by emphasizing the health benefits of travelling actively to school.

It seems that the social climate in the playground also plays an important part in children's PA. Children, themselves, can be given appropriate responsibility and trained to intervene in situations of conflict which are spoiling active games. Schools could also invest in additional training for mid-day supervisors with regard to taking more of an active part in encouraging active pursuits for children who want to be involved during their lunch times.

7.6 FUTURE RESEARCH

Checklist/QSOE responses could be further validated by direct observation and face to face structured interviews with school representatives which would allow for information to be verified about specific policies. Exploratory factor analysis could be undertaken to explore relationships between survey items. Internal consistency could be assessed between items thought to measure the same constructs. If construct scales are evident, relationship between QSOE 'scores' and children's PA could be assessed as further validation of the instrument.

Furthermore, it is suggested that future surveys seeking to identify important components of the school PA environment might incorporate questions about how children perceive that setting. Schools are well set up to enable easy distribution of questions to any number of children, once consent has been sought. Responses could be made online during computing lessons, given as brief 'morning tasks,' completed through school groups or sent home as part of a newsletter, which could include a consent statement to be returned with the child's ideas. With this in mind the first 7 questions of the summary checklist (Table 7.1) are concerned with children's perceptions of physical aspects of their playground. These could be presented in an accessible format involving, for example, emoji rating lines. It is acknowledged that these would be subjective ratings. However, exploring these ratings in different groups would help to establish which aspects of school outdoor environmental provision appeal to different children. These questions could be used as a starting point for developing a more comprehensive survey for children through which they could express their thoughts and views about being active in the outdoor environment.

Some researchers have found that children's perceptual ratings of neighbourhood environments relating to PA, including opinions about aesthetics have at least fair test-re-test reliability (Hume et al, 2006), correspondence with adult observations (Dunton et al, 2012) and may also have some association with the prevalence or frequency of PA behaviours (Comstock et al, 2016, Hume et al, 2007). Even where objective assessment of the environment has been found to be negative, children may perceive their surroundings in a positive light and it is those perceptions which appear to be associated with PA (Comstock et al, 2016). Ishii et al (2014) also found that when children's perceptions of their school playground equipment and facilities were good, they had higher levels of PA at recess time although for boys and girls, these perceptions impacted their lunch-time PA in different ways. Children's enjoyment of facilities has also been seen to have a positive impact on their PA, with girls and boys enjoying different aspects of the playground (Hyndman and Lester, 2015). It seems that in failing to incorporate children's own impressions and feelings about their environment, schools are likely to miss useful opportunities for enabling children to engage in fulfilling active play.

Future investigations, too, could explore perceptions of the school outdoor environment from children in different groups so as to gain more appreciation of the diversity of provision that needs to be made for them to feel motivated to be active such as in a recent study, for example, which specifically explored differences between perceptions in younger and older girls of their schoolyard. Although all girls reported similar preferences for activities and facilities, there were some distinct differences between the girls at different ages (Pawlowski et al, 2019b). Given the significant decline in PA between years 5 and 6, it is particularly important to identify factors which help to maintain activity through the primary years and children's own perceptions could provide useful insights into this issue.

Future work might also evaluate individual components presented in the summary checklist through cluster controlled interventions to determine their value for multi-pronged trials. Studies could explore, for example, whether the introduction of sports' ambassadors schemes in schools or the provision of training for outdoor education has any impact on children's PA levels. The ways in which recycled materials can be utilised to stimulate children's imagination might be investigated further in UK schools following on from the 'Scrapstore Play-pod' initiative in Bristol (Armitage, 2009) and studies in Australia which suggest that there could be numerous benefits in addition to accumulation of more PA through this kind of approach (Mahony et al, 2017; Snow et al, 2019).

Multi-component strategies have been found to be promising for increasing children's school-based PA (Brandes et al, 2022; Messing et al, 2019; Public Health England, 2020a; Russ et al, 2015) especially those that have a solid theory base (Brandes et al, 2022) and it has been shown that interventions for changing health behaviours are more effective when based on specific theoretical models of behaviour change and could be even stronger when theories are combined (Glanz and Bishop, 2010). With this in mind, the possible components of a school-based intervention informed by the summary checklist (Table 7.1) and within a theoretical framework of the Multi-Theory Model of behaviour change (MTM) are presented (Figure 7.1). It is proposed that this could be operationalised as a cluster RCT over the period of one school year with objective measures of children's PA being taken at defined points of the trial and planned follow-up over a longer period of time.

The Multi-Theory Model (MTM) of behaviour change (Sharma, 2018) is a synthesis of several previous models through which health behaviours are thought to occur. In the MTM, health behaviour is thought to change through two phases. The first, initiation phase is thought to need the participant to engage in *participatory dialogue*, involving the exploration of the advantages and disadvantages of changing the health behaviour with others, gain *behavioural confidence* from internal and external sources which can help to ensure that the health behaviour plays out into the future and experience *changes in their physical environment* through the presence of and access to facilities (Sharma, 2018). The continuation/sustaining phase involves the concept of *emotional transformation* whereby the participant directs their emotional energy towards the behavioural goal, *practice for change*, involving the participant's active awareness and monitoring of their health behaviours and *change in social environment* through establishing social support in the individual's environment (Sharma, 2018).

As illustrated in Figure 7.1, in the *initiation phase,* children would engage in *participatory dialogue* about the health benefits of PA through watching an introductory video, discussing advantages and disadvantages of being active with their peers and being led in further discussion by their teachers. *Changes to the physical environment* would involve the introduction of re-cycled or commercially available construction materials/large loose parts to a designated area of the school grounds to which children would have regular and easy access. Children would be introduced to the idea of interacting with these materials in the playground and gain *behavioural confidence* through learning about the scope of the equipment, demonstrations by children in roles of responsibility and by being given encouragement to use the equipment from adults who are trained about how to support children's creativity and to tolerate some element of risk. During the *continuation phase*, *changes to the social environment* would involve enabling children in roles of responsibility to promote and support PA across the school and involving staff in continuing professional development so that they are confident about implementing the changes in the playground. Children's *emotional transformation* could be facilitated in a variety of ways including through role-playing of difficult scenarios, game-based strategies, rewards and 'showing off' and children could *practice for change* by recording their achievements daily during a short, designated slot in the school day.

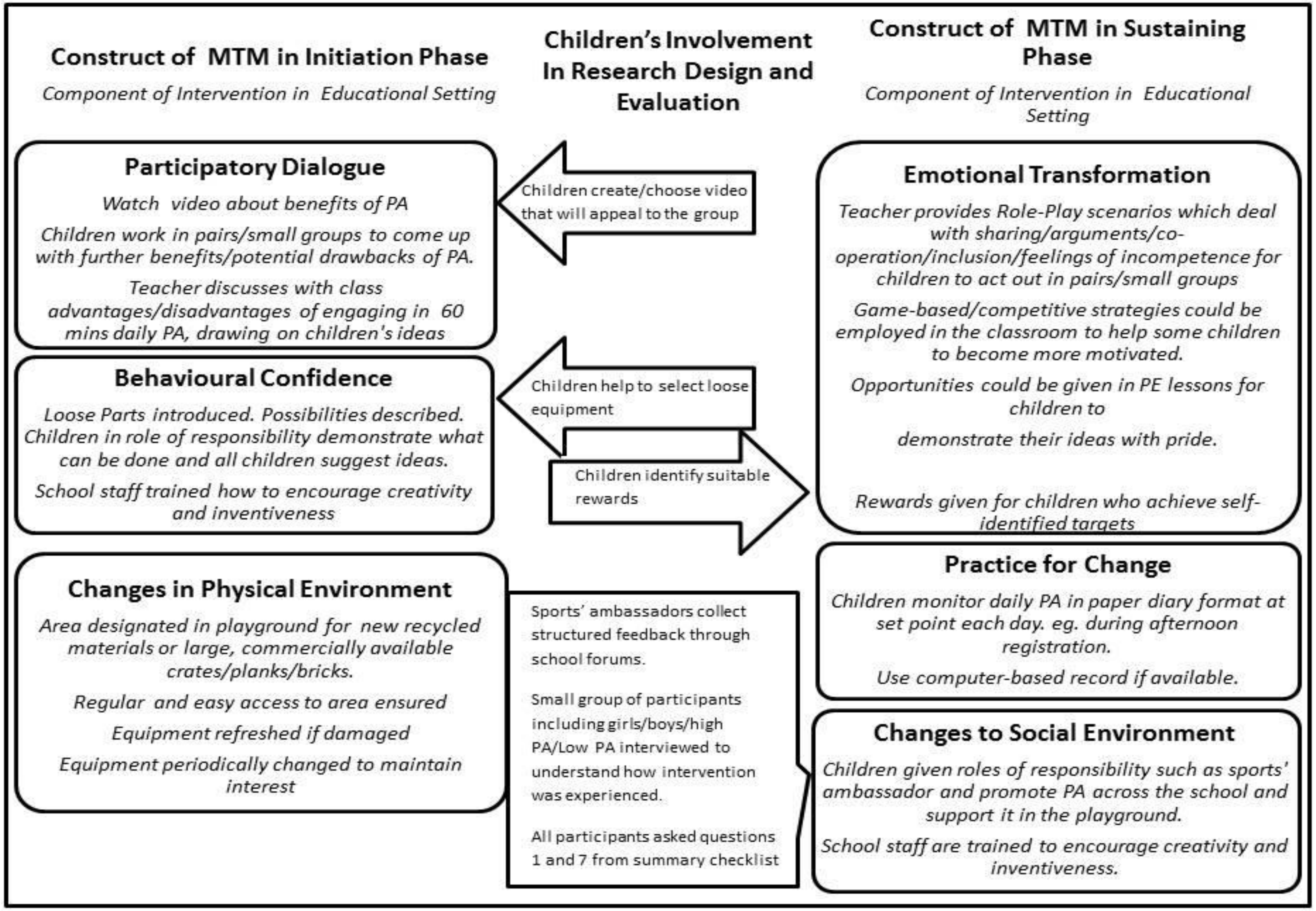


Figure 7.1: Components of proposed intervention based on MTM

Children could be involved in the design process at various points as indicated in Figure 7.1., perhaps by choosing or creating a suitable video or identifying appealing equipment and rewards from a set of choices that fit within the scope of the project. They could be given an opportunity to put forward alternative ideas for consideration. Adults might gain new perspectives through hearing children's thoughts and children are likely to be responsive to their peers' suggestions. Similarly, child participants might give feedback about the project to children in roles of responsibility during class-based forums which could be fed back to the researchers and form part of the evaluative process. All participating children could be surveyed about how they perceive their school outdoor environment with respect to 'fun' and 'suitability for PA' before and after the intervention (See Table 7.1; Questions 1 and 7). Some participants, too, could be interviewed in more depth to discover which particular parts of the project had an impact on children's ability to be active at school.

A whole scale participatory approach is increasingly being explored as a methodology through which children can work together with researchers, schools and communities to develop ideas and actions particularly relevant to children and which might therefore foster sustainable change (Gibbs et al, 2018). This type of participatory health research (PHR) has shown that children are able to learn research skills and influence stakeholders through the process and that their peers are more likely to take their ideas seriously as they have been suggested by children (Anselma et al, 2019; Anselma et al, 2020). By working in this way, a deeper understanding of issues important to children can be gained as children may be able to offer insights that adults have missed (Caro et al, 2016). Logistics of PHR can be complicated in a school setting although utilising groups such as school councils or after-school clubs which are already staffed and have a time allocation could offer researchers ways to implement participatory research with children in schools.

In depth process evaluation is needed in future intervention studies to develop understanding of why something works with particular groups of children at a particular time in a particular setting. Increasingly, critical realist methodology, aiming to uncover underlying processes, is being used to explore these types of questions (e.g. Defever et al, 2021; Gosselin and Laberge, 2022; Hall et al, 2021). Through a specific process of investigating theorised mechanisms known as CMO (context - mechanism -outcome), researchers can begin to explain outcomes that occur at any one point in time and space (Pawson and Tilley, 1997; Westhorp et al, 2011).

It has been suggested that for sustainable change in children's PA behaviours, interventions across multiple settings will be needed (Adab et al, 2018; Love et al, 2019). For children of primary-school age, family and parents are likely to be critical for changing behaviours such as ATS and it is, perhaps by developing the links between school and home that children's active behaviours might be encouraged to the best effect. In an evaluation study, examining parent and child perceptions of a school obesity prevention programme, parents commented on the importance of school for lending weight to dietary health messages which could then be followed through at home. Parents felt empowered and supported to promote healthy behaviours themselves and children felt inspired to influence their parents to make changes. Whilst parents believed that they held the final responsibility for their children's obesity-related behaviours, they also thought that schools offered important lessons to children regarding their current and future health (Clarke et al, 2015). Direct and active engagement of parents with school-based PA interventions has been shown to have beneficial effects on children's PA in most cases (Verjans-Janssen et al, 2018).

A variety of strategies could be used by schools to harness support from parents and family including communication via the use of newsletters and social media which are already established platforms in most schools as well as utilising parent-teacher consultations (Erwin et al, 2013). Schools might provide homework in the form of PA activities or organise sporting events which involve the whole family. Spreading the net further, schools could also forge links with local community partners who can extend promotion efforts outside the school (Erwin et al, 2013).

Future research could explore how children's motivation and enthusiasm might be developed by parents and teachers through controlled experimental designs involving educational activities and game elements which might strongly motivate children to want to behave in healthy ways. These types of activity could fit in easily to the curriculum and therefore place a low burden on the school (Rutberg and Lindqvist, 2018). Schools are in a unique position where they can and do easily contact and involve parents in new initiatives and create stimulating and rewarding challenges for children. Integrating health messages and soliciting parental views and ideas which could be used to drive ATS forward could form a feasible school-based intervention.

7.7 THE COVID-19 LEGACY

It is interesting to consider whether the COVID-19 pandemic, which has been playing out at the time of writing this thesis will have any lasting effect on school provision for PA in the outdoor environment. Data for the summer term (May-July), 2020, during the UK lockdown indicated that children's PA had fallen by 2.3% compared with a similar period in 2019, with greater negative impact being seen especially in Year 5 and 6 boys and some ethnic groups. Active play, informal activities and team sports especially were aspects of PA seen to be negatively affected (Sport England, 2021). Enjoyment of participating in sports and exercise too dropped for Year 5 and Year 6 children, particularly for boys and children from less affluent families during the pandemic and children's PA related confidence and competence decreased in primary aged children as a whole (Sport England, 2021). When surveyed during lockdown (May, 2020) young people who had changed their sport and exercise or who were not doing any at all, reported that they had had less chance to be physically active when they were not at school (Sport England, 2020).

In light of these data, the role of the school for encouraging children to be active as school life gradually returns to normal could be of particular importance. Special attention, for example, may be needed for supporting boys in particular and all children to feel more confident and competent as sporting activities are re-introduced and as playtime has been argued to be critical for children's physical and mental well-being at this time (McNamara et al, 2020), thought will need to be given to how playtimes can provide opportunities for active and social play in a supportive, safe and inclusive environment. With on-going restrictions being placed on segregated 'bubbles' of children within schools, rotas to limit crowding, imaginative use of spaces for isolating groups and class-specific equipment are strategies that could help schools to continue daily break-time provision (McNamara et al, 2020). Schools might also develop strategies which aim to encourage and maintain the positive shift towards ATS that has been seen in some children during the pandemic (Sport England, 2021).

One Learning through Landscapes (2020) project, 'My School, My Planet,' focussing on children's physical and mental health post-pandemic demonstrated that children's PA could be positively impacted by through an outdoor learning programme which encouraged children to engage with outdoor activities in their school grounds. As well as gaining new environmental knowledge and positive feelings about their own school environment, children's PA also increased through activities such as walking, digging and building. These positive findings suggest that this type of holistic approach to learning might be of benefit to all children as they navigate the return to school.

Some reports, too, suggested that the COVID crisis could act as a springboard for schools to move towards more outdoor learning (BBC News, 2020), with news of high demand for training in outdoor education as social restrictions drove schools to use their outdoor spaces more. As outdoor spaces offered the opportunity for social distancing (BBC News, 2020; Brooks, 2020; Mulvahill, 2020), taking lessons outside was well advised and provided an opportunity for children to leave the stress of socially distanced classrooms. While acknowledging the practicality of outdoor learning at this time, some writers have suggested that educators and policy makers might use this opportunity to thoroughly investigate how this way of working could benefit children's health and well-being going forward (Gray, in Quay et al, 2020) and to establish it firmly into school practices (Passy, in Quay et al, 2020).

However, teachers have also reported learning deficits and delays in primary aged pupils with 44% children thought to be in need of intensive catch-up support (Sharp et al, 2020) and the Department for Education (2021, P4) have advised that schools should '*prioritise teaching missed content*' as the guiding principle for the COVID recovery curriculum. In the face of pressures from anxious parents, governing bodies and Ofsted to demonstrate improved results, the movement towards learning in the outdoors might well be placed on the back burner, particularly as this type of work does not, necessarily lend itself to paper-based evidence of achievement.

7.8 FINAL CONCLUSIONS

This thesis has been guided by an ecological framework for exploring, in depth, primary aged children's PA in the school outdoor environment. It has shown that multiple factors involving physical and social elements of school provision as well as institutional strategies and practices are likely to have an impact on children's PA. The thesis has added to knowledge-base surrounding children's school-based PA and has informed a summary checklist of items which could form the basis of school self-assessment, further development of a school outdoor environment measuring tool or structured interventions. One theory-based intervention has been suggested for trialling in schools.

In addition, this thesis has contributed to the understanding of how to work with children when eliciting their views in a school setting, with interviews being suggested as a preferred way of working when investigating perceptions of PA related factors. It has been seen that children's perceptions vary considerably and that these variations may need to be taken into consideration when designing outdoor spaces and opportunities. It is thought that the pupil voice could be utilised to good effect to give guidance about what matters to individuals and groups when it comes to being active. Suggestions have been made about how children could become involved in designing and evaluating the school-based intervention.

At the current time, as the COVID-19 pandemic evolves, the school outdoor environment is an important place where children can play and engage in physical activities together. Furthermore, when children learn in that space, there is evidence that they do well educationally, engage in more PA and gain multiple health benefits. As the COVID crisis has driven many schools to make greater use of their grounds in order to allow socially distanced learning activities to take place, this time could, perhaps be an opportune starting point for educators to meet the challenge of making longer-term sustainable changes that will enable them to facilitate children's PA in the outdoor environment.

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APPENDIX 1

ETHICS APPROVAL FOR STUDIES IN CHAPTER 3 AND CHAPTER 4

The University of Nottingham

Direct line/e-mail
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Louise.Sabir@nottingham.ac.uk

Faculty of Medicine and Health Sciences

Research Ethics Committee
School of Medicine Education Centre
B Floor, Medical School
Queen's Medical Centre Campus
Nottingham University Hospitals
Nottingham
NG7 2UH

4th June 2015

QMC Campus
Nottingham University Hospitals
NG7 2UH

Dear

Ethics Reference No: B14052015 SoM ROD
Study Title: An investigation into the School Factors associated with children's physical activity in the outdoor environment.
Chief Researcher/Academic Supervisors: Dr Kim Edwards, Course Director Sports and Exercise Medicine, Division of Rheumatology, Orthopaedics and Dermatology, School of Medicine.
Other key researchers: Professor Cris Glazebrook, Head of Division of Psychiatry and Applied Psychology, School of Medicine, Professor Ian Macdonald, Head of School/Professor of Metabolic Physiology, School of Life Sciences.
Student researcher: Kay Woolley, PhD Student, Division of Rheumatology, Orthopaedics and Dermatology, School of Medicine.
Duration of Study: 01/06//15-17/12/15, 6 mths **No of Subjects:** 48 (10-65 yrs)

Thank you for submitting the above application which was reviewed by the Committee at its meeting on the 14th May 2015 and the following documents were received:

Qualitative School Study KW01: FMHS Research Ethics Application Form, V 3, 16.04.15
Qualitative School Study KW01: Protocol, V 3, 16.04.15
Qualitative School Study KW01: Participant Information Sheet, V 2, 16.04.15
Qualitative School Study KW01: Participant Information Leaflet for Children, V 2, 16.04.15
Qualitative School Study KW01: Participant Information Leaflet for Children for Pilot Study, V2, 16.04.15
Qualitative School Study KW01: Participant Information Leaflet for Children for Pilot Study, V3, 02.06.15-revised
Qualitative School Study KW01: Participant Information Sheet for Parents and Guardians, V1, 16.04.15 1
Qualitative School Study KW01: Participant Information Sheet for Parents for Pilot Study, V 1, 16.04.15 1
Qualitative School Study KW01: Consent Form for Adults, V 2, 16.04.2015
Qualitative School Study KW01: Consent Form for Children, V 2, 16.04.2015
Qualitative School Study KW01: Consent Form for Children for Pilot Study, V 2, 16.04.2015
Qualitative School Study KW01: Consent Form for Children for Pilot Study, V 3, 02.06.2015 - revised
Qualitative School Study KW01: Opt-Out Form for Adult on behalf of Child, V 1, 16.04.2015
Qualitative School Study KW01: Head teacher invite email, V 2, 16.04.2015
Qualitative School Study KW01: Participant Information Sheet for Head Teachers, V 1, 16.04.2015
Qualitative School Study KW01: Invitation Poster, V 1, 16.04.2015
Qualitative School Study KW01: Example Images, V 1,16.04.2015

These have been reviewed and the study is approved.

Approval is given on the understanding that the Conditions of Approval set out below are followed.

1. You must follow the protocol agreed and inform the Committee of any changes using a notification of amendment form (please request a form).

2. You must notify the Chair of any serious or unexpected event.

3. This study is approved for the period of active recruitment requested. The Committee also provides a further 5 year approval for any necessary work to be performed on the study which may arise in the process of publication and peer review.

4. An End of Project Progress Report is completed and returned when the study has finished (Please request a form).

Yours sincerely

Dr Clodagh Dugdale
Chair, Faculty of Medicine & Health Sciences Research Ethics Committee

APPENDIX 2

ETHICS APPROVAL FOR STUDIES IN CHAPTER 5 AND CHAPTER 6

E-mail: FMHS-ResearchEthics@nottingham.ac.uk

Faculty of Medicine and Health Sciences

Research Ethics Committee
C/o Faculty PVC Office
School of Medicine Education Centre
B Floor, Medical School
Queen's Medical Centre Campus
Nottingham University Hospitals
Nottingham
NG7 2UH

5th June 2017

Kay Woolley
PhD Student
c/o Dr Kim Edwards, Course Director
Academic Orthopaedics, Trauma and Sports Medicine
C Floor, West Block
School of Medicine
QMC Campus
Nottingham University Hospitals
NG7 2UH

Dear Kay

Ethics Reference No: D200317 **– please always quote**	
Study Title: Relationship between quality of outdoor environment in primary schools and children's self rated physical activity levels. **Short Title:** School Survey/KW02	
Chief Investigator/Supervisor: Dr Kim Edwards, Course Director Sports and Exercise Medicine, Academic orthopaedics, Trauma and Sports Medicine.	
Lead Investigators/student: Kay Woolley, PhD Student, Academic Orthopaedics, Trauma and Sports Medicine.	
Other Key Investigators: Dr Cris Glazebrook, Professor of Health Psychology, Division of Psychiatry and Applied Psychology, Professor Ian Macdonald, Head of School of Life Sciences, Professor of Metabolic Physiology, School of Life Sciences.	
Type of Study: PhD Project	
Proposed Start Date: 01.03.2017	**Proposed End Date:** 31.07.2018 18mths
No of Subjects: 315 per group	**Age:** 9-11 years (years 5 and 6)
School: Medicine, Life Sciences	

Thank your letter dated 26 April 2017 responding to the comments made by the Committee at its meeting on 20th March 2017 and the following documents were received:

- School Survey KW02 Protocol V6 24.04.2017
- Physical Activity Questionnaire
- School Survey KW02 School Physical Activity Measurement Participant Information Sheet V2 06.02.2017
- School Survey KW02 School Physical Activity Measurement Participant Information Sheet for Parents/Guardians V2 24.04.2017
- FMHS REC Application form and supporting documents version 2.0: 06.02.2017

These have been reviewed and are satisfactory and the study has been given a favourable opinion.

A favourable opinion is given on the understanding that the conditions set out below are followed:

1. You should follow the protocol agreed and inform the Committee of any changes using a notification of amendment form (please request a form).

2. You must notify the Chair of any serious or unexpected event.

3. This study is approved for the period of active recruitment requested. The Committee also provides a further 5 year approval for any necessary work to be performed on the study which may arise in the process of publication and peer review.

4. An End of Project Progress Report is completed and returned when the study has finished (Please request a form).

Yours sincerely

pp

Professor Ravi Mahajan
Chair, Faculty of Medicine & Health Sciences Research Ethics Committee

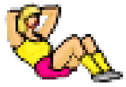
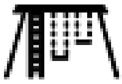
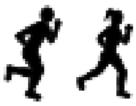
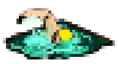
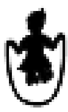
APPENDIX 3

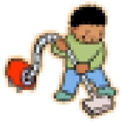
PHYSICAL ACTIVITY QUESTIONNAIRE

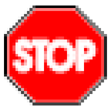
Physical Activity Questionnaire (PAQ) **School ID:**

Section A. What did you do today before school?

Please circle to show whether you did the activity not at all or a little or a lot.

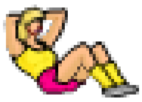
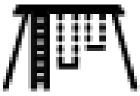
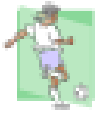
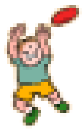
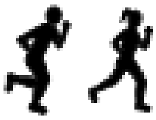
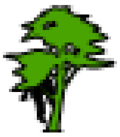
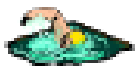
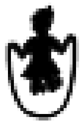
1.	Bicycling		1 None	2 A little	3 A lot
2.	Exercise: push-ups, sit-ups, weight training		1 None	2 A little	3 A lot
3.	Climbing on playground equipment		1 None	2 A little	3 A lot
4.	Team sports: football, netball		1 None	2 A little	3 A lot
5.	Racket Sports: badminton, tennis		1 None	2 A little	3 A lot
6.	Ball games: dodge ball, frisbee		1 None	2 A little	3 A lot
7.	Games: chase, hopscotch		1 None	2 A little	3 A lot
8.	Outdoor Play: climbing trees, hide & seek		1 None	2 A little	3 A lot
9.	Swimming:		1 None	2 A little	3 A lot
10.	Skipping		1 None	2 A little	3 A lot
11.	Dancing		1 None	2 A little	3 A lot

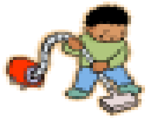
12. Walking		1 None	2 A little	3 A lot
13. Running		1 None	2 A little	3 A lot
14. Skateboarding / Skating		1 None	2 A little	3 A lot
15. Housework		1 None	2 A little	3 A lot
16. Other activity ________________	?	1 None	2 A little	3 A lot



Before school

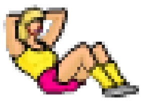
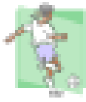
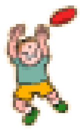
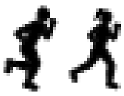
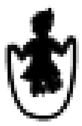
Section B. What activities did you do yesterday after school or the last day you were at school?

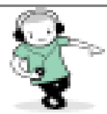
1.	Bicycling		1 None	2 A little	3 A lot
2.	Exercise: push-ups, sit-ups, weight training		1 None	2 A little	3 A lot
3.	Climbing on playground equipment		1 None	2 A little	3 A lot
4.	Team sports: football, netball		1 None	2 A little	3 A lot
5.	Racket Sports: badminton, tennis		1 None	2 A little	3 A lot
6.	Ball games: dodge ball, Frisbee		1 None	2 A little	3 A lot
7.	Games: chase, hopscotch		1 None	2 A little	3 A lot
8.	Outdoor Play: climbing trees, hide & seek		1 None	2 A little	3 A lot
9.	Swimming:		1 None	2 A little	3 A lot
10.	Skipping		1 None	2 A little	3 A lot
11.	Dance		1 None	2 A little	3 A lot
12.	Walking		1 None	2 A little	3 A lot

13. Running		1 None	2 A little	3 A lot
14. Skateboarding / Skating		1 None	2 A little	3 A lot
15. Housework		1 None	2 A little	3 A lot
16. Other activity ______________	?	1 None	2 A little	3 A lot

After school

Section C. What activities did you do during school yesterday or the last day you were at school?

1. Exercise: push-ups, sit-ups, weights		1 None	2 A little	3 A lot
2. Gymnastics: bars, beams, trampoline		1 None	2 A little	3 A lot
3. Team sports: football, netball		1 None	2 A little	3 A lot
4. Racket Sports: badminton, tennis		1 None	2 A little	3 A lot
5. Ball playing: frisbee, catch		1 None	2 A little	3 A lot
6. Games: chase, tag, hopscotch		1 None	2 A little	3 A lot
7. Climbing on playground equipment		1 None	2 A little	3 A lot
8. Skipping		1 None	2 A little	3 A lot

9. Dancing		1 None	2 A little	3 A lot
10. Walking		1 None	2 A little	3 A lot
11. Running		1 None	2 A little	3 A lot
12. Other during school_______________	?	1 None	2 A little	3 A lot

During school

APPENDIX 4

QUALITY OF SCHOOL ENVIRONMENT SURVEY (QSOE)

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

School Outdoor Environment Survey

Page 1: Introduction

Many potential influences have been observed in schools' outdoor environments which might affect children's activity levels. Physical, social and policy aspects are all thought to play a part.

This is a survey to find out about your school's outdoor environment. By collecting this information about many different schools, we can begin to form a picture of the provision that schools make to encourage children to be active when they are outside and use that information to help us to understand what features and resources are important for facilitating children''s physical activity in a school outdoor environment.

For more detailed information about this survey, please refer to the participant information document which can be viewed at:

xxxxxxxxxxxxxxxxxx

or contact Kay Woolley at Kay.Woolley@nottingham.ac.uk.

This survey is made up of 9 sections.

It will take approximately 20 minutes to complete.

Thank you for taking this time to help with our research.

Page 2: Section 1: Details about your school

1. Name of school

2. Postcode

3. Number on Roll:

4. Location of School

☐ Urban ☐ Rural ☐ Suburban

5. Role of person completing survey

Page 3: Section 2: Spaces in the outdoor environment at your school

We would like to know about the spaces in the outdoor environment at your school.

For the following two questions, please consider space to include all outside areas such as hard surface areas, fields, paths, grassy banks, gardens, woodland etc.

6. Please indicate to what extent the following statements describe the amount of outdoor space you have at your school with relation to the number of children.

Please don't select more than 1 answer(s) per row.

	strongly agree	agree	neither agree nor disagree	disagree	strongly disagree
School space is crowded	☐	☐	☐	☐	☐
School space is extensive	☐	☐	☐	☐	☐
Children have enough space to play	☐	☐	☐	☐	☐

7. Which of the following spaces do you have at your school? Please select all that apply.

- ☐ hard play area/s
- ☐ field/s
- ☐ grassy bank/s
- ☐ slope/s
- ☐ garden/s
- ☐ pathways
- ☐ multi-weather surface area/s
- ☐ wooded area/s
- ☐ wildlife area/s
- ☐ marked zone/s for play
- ☐ fenced/walled area/s
- ☐ small area/s between buildings
- ☐ designated quiet area/s
- ☐ covered area/s
- ☐ shaded area/s
- ☐ use of additional areas outside the school
- ☐ outdoor areas designated for transition children (Y1 in primary schools or Y3 in junior schools)
- ☐ Other

7.a. If you selected Other, please specify:

7.b. How do you think your school utilises its outdoor space?

Please don't select more than 1 answer(s) per row.

	fully utilised	well utilised	moderately utilised	somewhat utilised	not well utilised
Space is....	☐	☐	☐	☐	☐

8. If your school has a field, when are children allowed to use it at break times (including lunch-break) ?

- ☐ at any time of year when conditions are suitable
- ☐ only in the better months of the year
- ☐ not at all
- ☐ N/A (no field)

9. If your school has a woodland area, please indicate when children are allowed to use it.

- [ ] only occasionally
- [ ] as routine part of break times
- [ ] only during lesson times
- [ ] following regular rota system
- [ ] not at all
- [ ] N/A (no woodland area)

9.a. At what times in the year are children allowed to use the woodland area?

- [ ] at any time of the year when conditions are suitable
- [ ] only in the better months of the year
- [ ] not at all
- [ ] N/A

Page 4: Section 3: Playground Equipment

In this section, there are questions about the equipment you have available to children in the outdoor environment at your school and about the kinds of games that children play when they are outside at break times.

The word 'playground' refers to any outdoor space at school.

Loose Equipment

10. Which items of loose equipment does your school have available for children to use in the playground at break times? (Excluding EYFS)

- [ ] football/s
- [ ] basketball/s
- [ ] tennis ball/s
- [ ] selection of balls
- [ ] skipping ropes
- [ ] hula hoops
- [ ] bean bags
- [ ] ribbons
- [ ] bats
- [ ] racquets
- [ ] litter pickers
- [ ] stilts
- [ ] hockey sticks
- [ ] frisbees
- [ ] large dice
- [ ] building bricks
- [ ] foam javelins
- [ ] digging equipment
- [ ] tags for games
- [ ] french skipping
- [ ] cones
- [ ] ball scoops
- [ ] parachute
- [ ] music equipment
- [ ] team/group bibs
- [ ] music player (for dance)
- [ ] Other

10.a. If you selected Other, please specify:

Page 5

11. If your school provides loose equipment for children to use at break times, which year group/s is it available for?

- ☐ EYFS
- ☐ KS1
- ☐ KS2
- ☐ all year groups
- ☐ loose equipment not available

12. When is loose equipment available for children to use?

- ☐ only playtimes
- ☐ only lunch break
- ☐ all playtimes
- ☐ only on certain days
- ☐ not at all
- ☐ N/A

12.a. When children are outside in rainy weather, are they still allowed to use the loose equipment?

- ☐ Yes
- ☐ No
- ☐ N/A

Page 6: Fixed Equipment

13. Which of the following fixed equipment items does your school have in the playground?

- ☐ trim trail
- ☐ climbing frame/s
- ☐ climbing wall/traversing wall
- ☐ basketball hoop/s
- ☐ slide/s
- ☐ swing/s
- ☐ tunnel/s
- ☐ football goals
- ☐ see-saw
- ☐ seats/benches
- ☐ monkey bars
- ☐ shelters
- ☐ flower planters
- ☐ arches
- ☐ Other

13.a. If you selected Other, please specify:

14. Please indicate when the fixed equipment in your playground is available for use.

	Yes	No
before school	○	○
after school	○	○
at break times	○	○
at lunch-break	○	○
in all weather conditions	○	○

Page 7: Playground Markings

15. Please indicate which of the following types of marking you have in the outdoor environment at your school.

- [ ] court/pitch markings on hard surface areas
- [ ] court/pitch markings on field
- [ ] running track
- [ ] hopscotch
- [ ] variety of painted markings
- [ ] no playground markings

16. Does your school provide chalk for children to create their own playground markings?

- [ ] Yes
- [ ] No
- [ ] Sometimes

Page 8: Section 4: Games and Activities

17. Please indicate which games are popular at your school **at playtimes (including lunch break)** for boys and/or girls.

	girls	boys
football	○	○
tag rugby	○	○
basketball	○	○
cricket	○	○
tennis	○	○
rounders	○	○
netball	○	○
dodge ball	○	○
rugby	○	○
hockey	○	○
badminton	○	○
cat and mouse	○	○
chasing games(tag/tig/dob)	○	○
bulldog	○	○

17.a. Please state any other games which are frequently played in your playground at break times.

18. Is equipment freely available for the games that are played ?

- [ ] Yes
- [ ] No

18.a. If you have answered no please explain what the limitations are.

19. Are there any games which are banned from your playground, either permanently or periodically?

☐ Yes ☐ No

19.a. If you have answered yes, please state which games and the reasons they are banned.

20. Is football still allowed as an option on the playground/field when weather conditions deteriorate?

☐ Yes ☐ No

21. Which activities are popular at your school **at playtimes (including lunch break)** for boys and/or girls.

	girls	boys
general running around	○	○
handstands	○	○
cartwheels	○	○
gymnastics	○	○
athletics activities	○	○
racing	○	○
relays	○	○
making up games	○	○
sitting and chatting	○	○
walking round chatting	○	○
jumping	○	○
jumping off equipment	○	○
catching and throwing	○	○
cheerleading	○	○
dancing	○	○
climbing trees	○	○
hide and seek	○	○

21.a. Please state any other **popular** activities that children enjoy at playtimes in your playground.

22. Are there any activities which are banned from the playground either permanently or periodically?

☐ Yes ☐ No

22.a. If you have answered yes please state which activities and the reasons they are banned.

23. Does your school participate in 'The Daily Mile?'

☐ Yes ☐ No

Page 10: Section 5: Before and After School Activities

24. What before-school clubs/activities does your school offer? If none, please state none.

25. Please indicate below which activities are offered regularly after school.

	Activity offered
rounders	○
tag rugby	○
boys' football	○
girls' football	○
mixed football	○
athletics	○
basketball	○
cricket	○
netball	○
tennis	○
racquet club	○
hockey	○
sport's leaders	○
multiskills	○
cross country	○
orienteering	○
forest schools	○
gymnastics	○
dancing	○
cheerleading	○
drama	○
musical production	○
sports hall athletics	○

25.a. If your school offers any other after-school activity where children are physically active, please add those here.

Page 11: Section 6: Outdoor Learning Opportunities

In this section, the questions are about formal learning opportunities that take place outside as part of a planned curriculum.

26. Which of the following options best describes how often lessons at your school (other than PE) are taught outside.

Please don't select more than 1 answer(s) per row.

	very often	often	sometimes	rarely	never
Lessons are taught outside...	☐	☐	☐	☐	☐

27. Have school staff received any training in the last two years in Outdoor Learning?

☐ Yes ☐ No

28. Does your school provide Forest Schools activities?

☐ Yes ☐ No

29. Do you have a school garden which is cultivated by pupils?

☐ Yes ☐ No

30. Does your school have a pond which is used for learning opportunities?

☐ Yes ☐ No

31. Do you have any covered areas in your outdoor space which are used as work-spaces? (excluding EYFS)

☐ Yes ☐ No

32. Does your school provide clothing items such as wellies, raincoats or sun-hats for children to borrow so they can work/play outside in all weather conditions?

☐ Yes ☐ No

Page 12: PE

33. Does your school have KS1 classes?

☐ Yes ☐ No

33.a. If yes, what time is allocated to each KS1 class per week for PE?

33.b. Does your school have KS2 classes?

☐ Yes ☐ No

33.b.i. If yes, what time is allocated to each KS2 class for PE each week?

33.c. Is there a policy for how much of the allocated PE time should be spent outside each week?

☐ Yes ☐ No

33.c.i. If yes, please specify.

33.d. When outdoor PE is scheduled, what happens if the weather is bad?

34. Which of the following best reflects school policy for when a child does not have a PE kit with them at school?

Please select at least 1 answer(s).

- ☐ child sits out of PE if he/she does not have PE kit
- ☐ child joins in if own clothes are suitable for the activity in PE
- ☐ child borrows PE kit from another child
- ☐ child borrows PE kit from school supply
- ☐ child is involved in game without being active. eg takes notes/scores
- ☐ child engages in other low level physical activity. eg walking round playground
- ☐ decision is left to individual staff
- ☐ Other

34.a. If you selected Other, please specify:

Page 13: Section 7: Active Transport

In this section, the questions are about how your school supports children to be active on the way to and from school.

35. Does your school allow children to cycle to school?

- [ ] Yes
- [ ] No

36. Please indicate which of the following your school has/does/provides which might facilitate children's active travel to and from school. Please select all that apply.

- [ ] cycle/scooter storage
- [ ] walk to school day/week
- [ ] bikeability
- [ ] road safety training
- [ ] junior road safety officers
- [ ] cycle helmet storage
- [ ] allows wheelie shoes
- [ ] allows scooters
- [ ] implements travel plan
- [ ] school reward systems
- [ ] health messages through the curriculum
- [ ] environmental messages through the curriculum
- [ ] walking school bus
- [ ] Other

36.a. If you selected Other, please specify:

Page 14: Section 8: Staff and Children

37. Which of the following adults **actively promote** or **join in with** children's activities in the outdoor environment at your school in break times (including lunch-times)?

- [ ] mid-day supervisor/s
- [ ] teacher/s
- [ ] teaching assistant/s
- [ ] head teacher
- [ ] external provider
- [ ] Other

37.a. If you selected Other, please specify:

38. Which of the following do adults do regularly at break-times?

	playtimes	lunch-break
get out/set out equipment	○	○
teach skills	○	○
act as referee	○	○
monitor playground	○	○
manage disputes	○	○
instigate games	○	○
directly encourage children to use equipment	○	○
provide additional support for vulnerable pupils	○	○
join in with games	○	○
other	○	○

38.a. If you selected Other please specify.

39. Do children in your school take on any of the following roles (or similar) in the playground?

- [ ] sports ambassadors
- [ ] play leaders
- [ ] sports captains
- [ ] buddies
- [ ] playground peace-makers
- [ ] Other

39.a. If you selected Other, please specify:

39.b. Do children receive training for these roles?

- [ ] Yes
- [ ] No

40. Do you have any of these pieces of equipment in your playground?

- [ ] friendship bench
- [ ] buddy bus-stop
- [ ] peace-maker station

41. Does your school have a clearly stated set of rules for playground behaviour?

- [ ] Yes
- [ ] No

42. Are rules displayed so that children can easily see them?

- [ ] Yes
- [ ] No

43. Would you say that bullying has been a problem in your playground?

- [ ] Yes
- [ ] No
- [ ] Occasionally

Page 15: Section 9: Policies and Practices

In this final section, the questions are about school policies and other practices which might encourage children to be active.

44. Does your school **regularly** take part in physically active inter-school tournaments/competitions/festivals?

- [ ] Yes
- [ ] No

45. Which of the following statements best match your school's policy for outdoor play when the weather is bad?

Please select at least 1 answer(s).

- [ ] Children play outside in all weathers.
- [ ] Children play outside until weather conditions are extreme.
- [ ] Children can choose whether to play inside or outside when weather conditions are bad.
- [ ] Children have access to indoor space for active play when the weather is bad.
- [ ] Children watch films when the weather is bad.
- [ ] Children stay generally seated in their classrooms when the weather is bad.
- [ ] Children play under sheltered areas outside when weather is bad.

46. Are children allowed to play in the playground in the 15 minute period before school starts?

- [ ] Yes
- [ ] No

47. Are children allowed to play in the playground during the 15 minutes after the end of school?

- [ ] Yes
- [ ] No